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Attending to Experience

a narrative study of early career teachers of primary mathematics, and an early career researcher, in a process of becoming/continuing

Attending to Experience: a narrative study of early career teachers of primary mathematics, and an early career researcher, in a process of becoming/continuing

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Abstract

In the following pages I explore the experiences of early career primary teachers who have an interest in mathematics education. My intention is to become more aware of what they do in their day-to-day mathematical school lives and what they consider significant to their development. In turn I question the role school-based mentors and mathematics teacher educators have in supporting their development.

I bring a narrative ontological and epistemological stance, shaped by postmodern thinking, to my work. I use a range of narrative structures to communicate my developing insights and celebrate the uncertainty of constructions of knowledge and reality.

My analysis, largely of interview data, offers a perspective usually obscured by dominant narratives of deficit and *what works.* I argue a shift in attention from a focus on the attainment of expertise as an end point, to the continuous processes of learning and change, may support the development of the primary mathematics specialists wished for in primary classrooms in England.

In keeping with the principles of narrative inquiry I recognise the blurring of the boundary between researcher and researched. I study my experiences as a beginning researcher alongside the experiences of the people I interview, establishing the *how* and the *what* of my methodology, as I develop my research practices. Staying with stories of development over time, and using approaches I come to describe as storying the small, writing *as if* and re-storying, in order that I might attend differently to the continuous nature of change, as beginners position themselves on new landscapes, are significant threads.

As a result of my work I seek to highlight methodological implications for working from a narrative position as I recognise connections between narrative inquiry, relational knowing and reflexivity and wonder at the possibilities being slow and knowing slow might offer in learning to attend to experience differently.

Acknowledgements

Laurinda and Alf. Thank you for believing I might be able to make this leap. Thank you for your guidance, your gentle challenges and silences, your generosity and patience. Thank you for not telling me what to do but supporting me to follow my own motivations to act. I consider myself incredibly privileged to have had your supervision throughout this study.

Malcolm Reed. Thank you for your teachings on narrative inquiry and for providing a wonderful reading list.

Laura, Holly, Sam, Izzy, Paula and all of the other people I interviewed. Thank you for sharing your stories. I hope you feel I have cared for them and interpreted them with sincerity, and have managed to capture some sense of your experiences. Often I was out of my depth but your kindness meant I could feel as if it was possible to act as a researcher.

Steve. Thank you for making philosophical paradigms alive by sharing your love of art. And for keeping me connected to the earthly world by making noise. And for singing there was an old lady who swallowed a fly.

To my mum

Jackie

for helping me with homework projects of the past.

Declaration

I declare that the work in this dissertation was carried out in accordance with the requirements of the University's regulations and Code of Practice for Research Degree Programmes and that it has not been submitted for any other academic award. Except where indicated by specific reference in the text, the work is the candidate's own work. Work done in collaboration with, or with the assistance of, others is indicated as such. Any views expressed in the dissertation are those of the author.

Signed: C J Ormesher

Date: 1st June 2020

Contents

About reading this study

In this study I take inspiration from my supervisors Laurinda Brown and Alf Coles; their thoughts and actions are woven throughout. For example, as I experience and think and write about labelling/not labelling I recognise how Laurinda and Alf work to not label in every conversation I have with them and to challenge, gently, labels I use. Similarly, as I write about learning to pause I feel Alf's silence and recall Laurinda's story of imagining holding her finger to her lips when she wants to remember to not utter the words on the tip of her tongue. When I bring them into my work in their supervisory role, I name them as Laurinda and Alf. When I refer to their academic work, I use standard referencing conventions, although the line between these roles often blurs.

The view I have come to hold of narrative inquiry is that the living, breathing narrative *is* the inquiry. The work of Clandinin and Connelly (2000) has been influential in, what have become, ways of thinking and being, and has shaped the way I have organised my writing. The building blocks of academic endeavour, philosophical paradigms, ethics, literature, methods and so on, are dispersed and threaded throughout the complete body of my work because, with a narrative view on the world, these lenses for thinking and organising are always worn and what could be perceived as separate units of study cohere to become an overarching methodology. Similarly, the perspectives in my study are multiple and layered: the voices of the early career researcher learning to research; the mathematics teacher educator learning to work alongside early career teachers and the early career teachers learning to teach primary mathematics are all present, along with views and ideas of many researchers and some policy makers too. I continued to read as my study progressed so my scholarly foundation grew over time and this development is reflected in the structure and flavour of my work. I kept (and continue to keep) a range of research diaries, seeing both informal and formal writing as integral to my research process. These are habits of mind and body practiced and cultivated over

time and influenced by the suggestions, firstly of Laurinda, then Altrichter, Posch and Somekh (1993), followed by Thomson and Kamler (2010), and more lately Speedy (2008), Clandinin and Connelly (2000) and Sedaris (2018).

In the process of analysing interview data, I noticed that we (me and the people I interviewed) sometimes re-voiced words (either of our own or those of another person) which had originally been uttered in a different place and at a different time. Also, sometimes we voiced imagined words, as if they had been said aloud. To show words brought forward from different contexts and those spoken from our imaginations I use double quotation marks. I use single quotation marks to reference the words of academics and researchers in line with other standard referencing conventions, although have chosen to use "and" rather than "&", in order to limit the use of symbols and so suit a narrative style of writing. Italics are used for emphasis and also to signal the use of a word or phrase that comes to stand for a particular idea relevant to my study. Occasionally I use a table or illustration to communicate a particular point or idea. These are informal jottings to support the showing of an idea, rather than discrete data to be referred back to, so I have not used labels or numbers to catalogue them.

Other conventions I develop and come to adopt are:

/ to indicate words and the ideas they represent tipping into each other

... to indicate the length of a pause between words

_____ to indicate I have removed some words to support clarity of meaning

( ) to denote interjections by either the interviewer or interviewee

[ ] to denote utterances other than words

indented text for transcribed interview material and extracts from field research diaries (and quotations of forty words or more)

centred text for highly edited interview material

right justified text and/or a different font for diary extracts

spaces to support the possibility of different reading paces.

Finally, the teaching profession has its own set of acronyms and terms and I have included a glossary (see Appendix 2) of the ones relevant to my study. I have deliberately limited the use of acronyms in order to suit a narrative style and also to support a smooth reading of text. There is one term I would like to mention in more detail at this point: postgraduate teacher. In texts I have read, people undertaking a teacher training qualification are referred to as trainee teachers (Goulding, Rowland, and Barber, 2002), pre-service teachers (Lutovac and Kaasila, 2018b) or prospective teachers (Chapman, 2008). At the beginning of this study, Laura, Holly and Sam, you will meet them in a while, were working towards their Post Graduate Certificate in Education (PGCE). A PGCE is a one- or two-year academic qualification and successful completion results in recommendation for Qualified Teacher Status (QTS) enabling registration as a qualified teacher. As such, Laura, Holly and Sam could be referred to as trainee or pre-service or prospective teachers. However, as I started writing about their experiences, none of these terms felt quite right as they imply such people are not teachers yet, even though they are actively involved in processes recognised as teaching. Once qualified, teachers in England are, for their first year of employment, referred to as newly qualified teachers (NQTs) and I have decided to adopt a similar convention, using the term postgraduate teacher to identify teachers in their PGCE year of teacher education.

PhD Mantra

Research what you want, how you want

Research what you want, how you want

Faster than fairies, faster than witches

Bridges and houses, hedges and ditches

Research what you want, how you want

Research what you want, how you want

Laurinda Brown, Robert Louis Stevenson, Caroline Ormesher

Part One

Subordinating talking to listening, certainty to uncertainty, fast to slow

Beads on Strings

When I started teaching in nineteen ninety-one, we used a round robin system with groups of children doing different things and moving from one activity to the next. I became aware I couldn't get a handle on their learning and felt I wasn't teaching anything so I changed things in my class. At the end of the year a maths vacancy with a pay incentive attached to it came up. I didn't consider applying initially but the Head teacher gave me a nudge. I had a day's support from the local authority primary maths advisor and we worked on mapping all of the elements of the National Curriculum in all of the maths textbooks we had. This gave me a good awareness of all of the different elements of the maths curriculum. Next I got a maths co-ordinator role in another part of the country. There were lots of opportunities for training and development, which was very different to my previous setting. I realised I had been going on instinct before but access to regular meetings, courses and expertise was really important for my development. Then the National Numeracy Strategy was introduced. I was invited to the launch; I did the five-day training and then led the training in my school; I caught the buzz. Much of this training was about resources and models and images and it was the first time I became aware of the importance of these. I was invited to be a lead teacher so people came to observe me teach. I also moved to the Early Years Foundation Stage due to staff changes and found that I had to learn maths again for this age group, as there was very little guidance around at this time. I followed the same process I had in my first post, going back to textbooks, mapping out areas of maths and learning from this experience. I then decided I wanted to teach abroad and applied to do Voluntary Service Overseas. I got a role as a maths lead responsible for training teachers. I took the National

Numeracy Strategy pack with me and led training days based around the materials. I had a strong sense of children being active in maths and teachers using lots of resources as being important so my training was built around this but we used materials we had to hand in place of resources like counting sticks. I returned to the U.K. to a Deputy Head role first leading music and then English. In time the Head realised my real strength was in maths and once I started leading maths, as a Deputy, I was able to really make a difference. It felt as if the school was stuck in maths and I wanted to know how to move it on. The first thing I did was arrange to send staff on training courses but after a time I realised I was not organising any training for myself and I needed to do this. Also I was still being pulled all over the school which, while it was good for understanding progression, meant that I was being stretched too thin. The local authority advisor told me about the Mathematics Specialist Teacher Programme with the warning that funding for it was about to be stopped. I applied within two days of the deadline and was offered a place. It was a two-year training programme and I did the Numbers Count training too. It took lots of commitment and dedication and was too much really especially with a family. The training led to another career change: I spoke to my Head, who I had got to know through this period of training, and found that he needed a Year 3/4 teacher and was prepared to shape a role to suit my needs. Now I work part time, am part of the senior leadership team, mentor and coach trainees and I also have dedicated time to lead maths in the school. This time allocation makes the crucial difference as a maths specialist; I have time to push initiatives and support staff. There is a cost to my class though, in having so many roles. I wouldn't call myself a maths specialist if I didn't have the Mathematics Specialist Teacher Programme training. It was two

years of intensive training at Master's level focused on the development of maths subject knowledge and pedagogy with lots of background reading and opportunities to discuss maths with others. The time pressures were immense but it was a lifeline to get back into thinking about maths education. I do think that the other training and experiences I have had all add to being a maths specialist too. I have had leadership and management training and coaching and mentoring training. I think being part of the senior leadership team also helps because I have the authority, position and confidence to lead. I don't know if you can short cut the time it takes to become a maths specialist. I think the idea of someone young coming in and trying to change things just because they have a maths A level or degree is a barrier. I am not sure that you can facilitate change just because you know about maths. I'd say that I had a passion and wanted to improve what was happening. I was driven to learn and to try and get it right myself although I don't always manage to get it right! I didn't have specialist knowledge, I only got a B at O level, but I did like maths and did lots at home with my dad and I enjoyed puzzles and problems so I didn't have a fear of it. I was always keen to take things on and having people on board who valued what I was doing helped. I realise some teachers do not have the subject knowledge for maths and I think this shows in the SATs results at our school; results are always better in English than maths. My current trainee, who is on the maths specialist route, shows a better grasp and understanding of maths than other trainees I have worked with and I have shared much more about the learning and teaching of maths with her than I usually do with trainees. We have trialled things and talked in depth about the minute detail of lessons in order to structure them well. There is some luck involved around being in the right place at the right time but also a

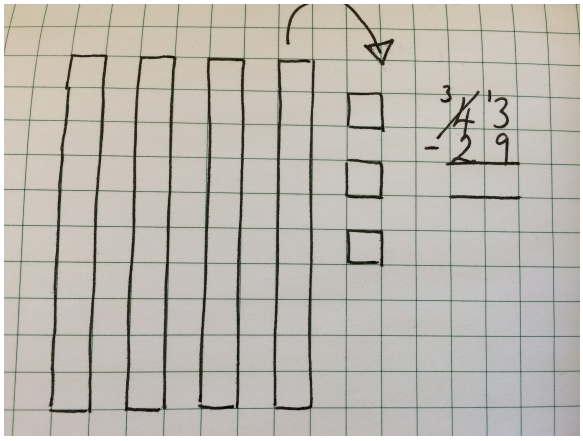
> willingness to do anything is important. I think that it is the whole experience that adds up to being a primary maths specialist (Paula, Interview, February 2016)

I love Paula's story: it has a strong female lead, it is fluent and coherent, it has a fair and just ending and it resonates with my story so I relate to it easily. When I met Paula her first words to me were: "I'm a maths specialist too". A connection was made and an opportunity for a thread of a life history to be shared arose. With little prompting Paula's story literally flooded out. It was as if it had been waiting, all polished and shiny, prepared and packaged, for the right audience to hear its telling. As a novice researcher keen to explore the experiences of primary teachers with an interest in mathematics, this felt like a good place to start: talk to someone who identifies themselves as a primary mathematics specialist and hear their story, get their perspective. What truths might I learn from Paula? If I would like to be a primary mathematics specialist I will need a vast amount of experience before I can begin to identify myself as one; I will need to work incredibly hard and dedicate myself to my chosen cause and probably make sacrifices along the way; much of my destiny will lie in the hands of others?

And yet. The first of many unexpected turns as I find the academic world of which I am now part has problematized the soul of peoples' accounts of their experiences, their personal knowings. Bruner's (1986) exhortation pulled me up short: 'At our most unguarded, we are all Naïve Realists who believe not only that *we* know what is "out there," but also that it is out there for *others* as well' (p.65, original italics). Freeman's (1998) nihilistic offer on the 'beads in bare sequence' humans are prone to provide in narrative accounts of their lives in order 'to give form to the flux, to make it all seem like there is a point, a purpose, a *meaning*' gave rise to despair (p.29, original italics) and Strawson's (2004) position on poor, deluded 'Diachronics' left me feeling somewhat deficient (p.431).

And yet and yet. While the naïve realist probably should have been read out of me by now I am unable to shed this recalcitrant skin. Rather I am sustained by possibilities of the credence of local knowledge as suggested by Ulmer (2017), Charon and Wyer's (2008) respect of anecdotal reality and the value Speedy (2008) places on being with the 'personal and culturally contingent stories' people tell (p.15). The unshakeable conviction there are nascent truths in the stories of experience we tell of ourselves to trusted others and that these truths are as valid and relevant as any other fragile truths constructed by researchers not only persists but grows.

I came to this study with some personal knowledge and experience of the idea of being a specialist in primary mathematics. If my memory serves me correctly, like Paula, my interest began at the start of my career. I was in my first teaching post with my first very own class and was planning a lesson on subtraction. I wanted to teach the children how to use the standard written method of decomposition and was working through a series of diagrams and explanations in the textbook we used at the school. They looked something like this:



As I worked with base ten apparatus alongside the decomposition "sums" a penny dropped and I could see why I had been crossing out numbers and writing little 1s for many years

and for the first time I could see how and why the algorithm I had been performing mechanically actually worked. A fresh engagement with mathematical procedures and concepts continued; I enjoyed relearning the mathematics I had been taught at primary school and I enjoyed teaching it to my class. I quickly became aware of many children struggling with the subject in much the same way I had as a child and I tried to teach it in a way that made it both enjoyable and understandable. How successful or not I was I will never know but I do know that my interest persisted and over my twenty or so years as a primary teacher it became the subject I specialised in.

There were significant moments and milestones in me developing this specialism on top of my day-to-day interest in the classroom: subject co-ordination (or subject leadership as it is now called); inspiring training days run by experts in the field; membership of the Association of Teachers of Mathematics (ATM) and the regular reading of their journal, Mathematics Teaching (MT); and the rolling out the National Numeracy Strategy (NNS) with all of the related training (DfE, 2011). Around seven years into my career I decided I wanted to do a Master's degree and was lucky enough to be accepted to study part-time at the University of Bristol. I chose to focus on mathematics education. I have a vivid memory of walking into the library, dipping into books and realising all of the things about learning and teaching mathematics I had been wrestling with for the previous seven years had also puzzled others and had been researched and written about. It transpired there was a huge knowledge base and mathematics education community out there for me to draw upon, in order to inform my practice. It took a few years but I completed my modules, wrote my dissertation and was awarded my Master's degree. The driving motivator behind my studies was to find out what was best: what did I need to know and do in order to be a really effective, even outstanding, teacher of primary mathematics?

Next, keen to focus on mathematics education more than I was able to as a general primary practitioner I took a brief foray into secondary education and also tried some freelance work

as a mathematics consultant. However, I was doing less of the mathematical activity I was interested in and missed having my own class to do mathematics with, so returned to the primary classroom as a general practitioner in 2008.

In 2007 the Secretary of State for Education commissioned a review of mathematics teaching in Early Years and Primary settings in the U.K. (Williams, 2008). A key recommendation was the:

> presence of a Mathematics Specialist in every primary school who will champion this challenging subject and act as the nucleus for achieving best pedagogical practice (p.1).

The review recognised mathematics at primary level as a demanding subject, concluded teachers need to be confident to teach it well and proposed such confidence comes from teachers having 'deep mathematical subject and pedagogical knowledge' (p.3). This was an important policy recommendation for me as it raised the profile of mathematics education in primary schools. In my school I think I was probably seen as our mathematics specialist, "the maths person", and the political spotlight on mathematics helped me to feel I was able to maintain some sort of focus on mathematics while teaching all of the other primary subjects too.

The theme of establishing specialist primary teachers in U.K. policy continued: the Cambridge Primary Review (Alexander, Hofkins, and Northen, 2009), challenged the status quo of generalist primary teachers arguing it as an out-dated model of educational provision designed for the Victorian era when classes were large, the curriculum basic and schooling, by necessity, cheap. The review suggested a model whereby specialist teachers might be employed not to replace generalist teachers but to supplement the knowledge base of a team in a primary setting.

In July 2014 the Department for Education launched its Maths Hub Programme and this national initiative continues to run. The central aim of the Maths Hub Programme is to 'drive up the quality of maths teaching' and the recruitment of mathematics specialists into teaching is seen as central to achieving this (DfE, 2013a, p.1). In October 2014 the National Centre for Excellence in the Teaching of Mathematics (NCETM) with The Association of Mathematics Education Teachers (AMET) produced guidance on mathematics specialist routes in Initial Teacher Education (ITE) (AMET and NCETM, 2014) and to attract people onto such routes the Government began to offer an enhanced bursary (DfE, 2015).

And so to another thread in this story. In September 2012 I became a lecturer on a primary Postgraduate Certificate in Education (PGCE) course at a university in the U.K.. I have several roles: teaching on the general primary mathematics and mathematics specialist routes; and being an Academic Tutor, which involves myriad administrative and pastoral tasks, for a number of postgraduate teachers. Although my job title is "lecturer" I tend to describe myself as a teacher educator or as a mathematics teacher educator depending on the context in which I find myself.

Recommendations in the review of Initial Teacher Education by Carter (2015) highlight the importance of a clear and sustained focus on the development of both subject knowledge and subject-specific pedagogy in Initial Teacher Education courses and in professional development opportunities for new teachers. The Teacher Standards (DfE, 2013b) require postgraduate teachers and qualified teachers to demonstrate good subject knowledge and a clear understanding of appropriate teaching strategies. The expectation of postgraduate teachers following primary mathematics specialist routes, to complete their training with a developed understanding of content knowledge and subject specific pedagogy of mathematics, underpins guidance (AMET and NCETM, 2014) and I am interested in how my role as a mathematics teacher educator might contribute to such development. In addition, policy guidance advocates such teachers to have:

> a clear pathway outlined as part of their Newly Qualified Teacher (NQT) plan which will enable them to continue to build their specialism with the aim of becoming a subject leader and / or specialist primary mathematics teacher in time and contributing to the development of mathematics in their setting' (AMET and NCETM, 2014, p.6).

How prepared the postgraduate teachers taking the mathematics specialist route are for this next step in their journey of becoming specialist teachers and what this journey will look like are therefore also issues of interest.

Shulman (1987) recognised a teacher's knowledge base as something other than a combination of: 'personal style, artful communication, knowing some subject matter, and applying the results of recent research on teaching effectiveness' (pp.5-6). He sought to explicate the 'categories of knowledge' underpinning the understanding a teacher requires in order to promote children's learning. Shulman named these categories as: 'content knowledge', 'general pedagogical knowledge', 'curriculum knowledge', 'pedagogical content knowledge', 'knowledge of learners and their characteristics', 'knowledge of educational contexts' and 'knowledge of educational ends' (p.8). Others have used his work in order to develop theoretical models related to a teacher's subject knowledge of mathematics in particular, for example, Ball, Thames, and Phelps (2008), Rowland and Turner (2008) and Ma (2010).

Ma (2010) explored teacher's subject knowledge and coined the phrase 'profound understanding of fundamental mathematics' (p.xxxiii) to capture the depth and reach of subject knowledge she sometimes observed, particularly of Chinese teachers:

> Profound understanding of fundamental mathematics goes beyond being able to compute correctly and to give a rationale for computational algorithms. A teacher with profound understanding of fundamental mathematics is not only

> aware of the conceptual structure and basic attitudes of mathematics inherent in elementary mathematics, but is also able to teach them to students (p.xxxiii).

There are links between Shulman's content knowledge and pedagogical content knowledge as he points out in his forward to Ma's book: 'This book appears to be about understanding the content of mathematics, rather than its pedagogy, but its conception of content is profoundly pedagogical' (Ma, 2010, p.xxi). Ma worked to evidence a teacher's subject knowledge by examining the ways in which they talked and reasoned about hypothetical situations from mathematics classrooms. The idea of specialism was not an overt theme in her book but I suggest the Chinese teachers held something akin to the 'deep mathematical subject and pedagogical knowledge' Williams (2008, p.3) talks of. With China again appearing at the top of the PISA tables (OECD, 2019), it seems plausible to suggest a profound understanding/specialist subject knowledge/deep subject knowledge might have a part to play in such results, the implication being, teachers with such subject knowledge might make for more effective ones. When reading Ma's book I was captivated by the examination and insight offered. I also felt rather uncomfortable: her work has made me question any claim I can make to being either a primary mathematics specialist or a mathematics teacher educator and highlighted my subject knowledge as not as profound/specialist/deep as I would like it to be. It seems possible there are other members of the education community in England in a similar position, with the goals for the learning and teaching of mathematics proposed by Williams in 2007 still promulgated in current policy and influencing movements in mathematics education (NCETM, 2020).

Integral to the Maths Hub Programme is the Shanghai Exchange Project (SEP). This project involves teachers from the U.K. and Shanghai visiting each other and undertaking a range of professional development activities in order to learn more of practices in mathematics education. As a consequence of this work, U.K. teachers are currently learning how to teach

mathematics in the Shanghai-style and to embed in their practice what has become known as a 'mastery pedagogy' (Boylan, Wolstenholme, Demack, Maxwell, Jay, Adams and Reaney, 2019, p.12). Mastery pedagogy is typified by an 'enhanced pedagogical subject knowledge' (Boylan, Maxwell, Wolstenholme, Jay, and Demack, 2018, p.8).

The final strand in this backdrop to my study is that of teacher development. Currently our PGCE course is shaped by models of teacher development described by Watzke (2007) as 'stage theories' (p.106). He suggests such theories focus on 'distinct characteristics in teacher development often presented within a chronological framework unrelated to the background of the teacher or teaching context' (p.106). In working with postgraduate teachers I have begun to question the adequacy of stage theories in framing development. Their backgrounds and teaching contexts seem central to their experiences and influence the way they work with children when doing mathematics. In addition, I have noticed postgraduate primary mathematics specialists completing their PGCE course with a strong sense of the issues in mathematics education they are interested in working with in their newly qualified teaching year. The thought of having their own class in September, and the apparent freedom to teach as they wish, is an exciting prospect full of potential. Sutherland, Claxton and Pollard (2003) speak of the culture clashes which may occur as individuals move from one group to another and I wonder how being a postgraduate primary mathematics specialist translates into being a newly qualified one, if the story of development is smooth or disrupted. I wonder if such teachers are accepted as having specialist qualities to bring to their settings when, as Shulman (1987) points out from his work with teachers: 'the knowledge, understanding, and skill we see displayed haltingly, and occasionally masterfully, among beginners are often demonstrated with ease by the expert' (p.5).

So, with this somewhat curated, but sincere nonetheless, chain of events behind me I stand at the brink of my PhD study, interested in the experiences of a particular group of people and in talking to them in order to come to know more about an aspect of their lives. To begin

to know what those experiences might be like and what they mean for the people going through them resonates with a narrative stance on conducting research. In these early days, capturing precisely what I mean when I say 'narrative stance' is a challenge. I do not yet have a language in which to convey the beginning to form thoughts slipping fleetingly through my mind, ones that do not quite reach my fingers in order to become communicated on the page. For the moment I will rely on the words of others

> [narrative] studies have temporal dimensions and address temporal matters; they focus on the personal and the social in a balance appropriate to the inquiry; and they occur in specific places or sequences of places (Clandinin and Connelly, 2000, p.50).

> [narrative inquiry] is well suited to addressing the issues of complexity and cultural and human centeredness in research (Webster and Mertova, 2007, p.3).

> narrative inquiry focuses qualitatively on participants' experience and the meanings given by them to that experience (Cortazzi and Jin, 2009, p.28).

while I establish the ways in which I want to talk about and communicate my position on this landscape of inquiry more surefootedly. In similar vein, I would like to end my opening gambit with a quotation from M. C. Bateson (1994):

> Wherever a story comes from, whether it is a familiar myth or a private memory, the retelling exemplifies the making of a connection from one pattern to another: a potential translation in which narrative becomes parable and the once upon a time comes to stand for some renascent truth… Our species thinks in metaphors and learns through stories (p.11).

The Hare and the Tortoise

> When I started teaching in nineteen ninety-one, we used a round robin system with groups of children doing different things and moving from one activity to the next. I became aware that I couldn't get a handle on their learning and felt I wasn't teaching anything so I changed things in my class (Paula, Interview, February 2016)

This is a snapshot of my retelling of Paula's telling. What she actually said went more like this:

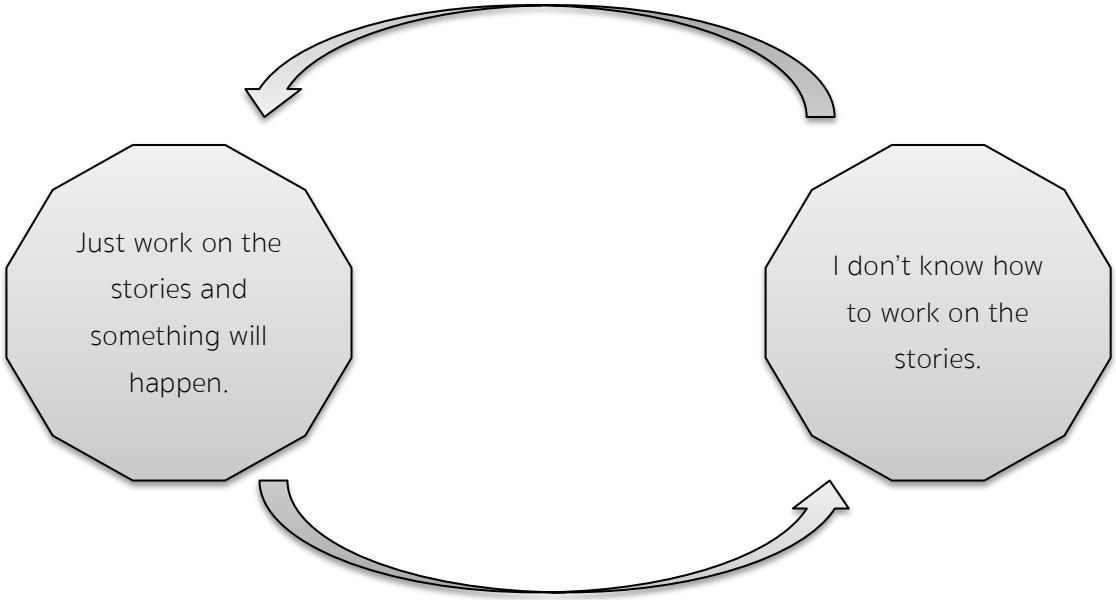
> in my first year . I took on what the school did for maths which was at the kind of . they didn't have any schemes . they had lots of different text books . they would at that time in the early nineteen-nineties . ninety-one they were teaching everything in a kind of round robin so they had different tables doing science . English . maths or art and that's how I did it . it was a large first school and I just felt … I felt that I wasn't … teaching maths . it felt wrong . I couldn't impart anything new . the children were working through a kind of text book exercise that was set but it felt that I couldn't get a handle on anything and so … it just I felt I should be teaching it and and moving them on so I changed that in my class (Paula, Interview, February 2016)

A year's worth of experience in four lines or in ten lines or in forty-three seconds depending on how you might want to re-present and quantify things. Riesmann (2008) proposes all stories as 'selective and perspectival, reflecting the power of memory to remember, forget, neglect, and amplify moments in the stream of experience' (p.29) and clearly Paula must have made some choices here, choices about what to offer in this narrated version of her experiences in her first year as a teacher. As compelling as Paula's parable is I wonder how far her sparkling beads can serve me in offering insight into the lived experiences of others.

What if instead I could manage to slow down time? Sort of step into it and stretch it out. I wonder what these forty-three seconds are like for people who are living through them. These moments when things feel wrong and we are compelled to make changes. What is in the undertow of these pauses and hesitations, when we cannot quite harness the right words to convey our thoughts? What experiences do early career primary mathematics specialists signal as being important in their development? When they act as primary mathematics specialists what do they do? Quite simply, when asked to talk about this aspect of their lives, what do they say? My wonderings accumulate and my interest in creating an account of the experiences of early career practitioners in the process of becoming primary mathematics specialists firms, takes shape: what can I learn from them and their experiences that might inform both me and others involved in teacher education and so contribute to the field?

As well as accessing the detail of experience of early career primary mathematics specialists by slowing down time, slowing has become an important personal quest for me in learning to be a researcher. Laurinda has encouraged me at every step of the way to "research what you want, how you want" but it is taking me a long time to come to know *how* I want to research what I *want* to research and is still a work in progress. In between creating an account of the experiences of others I have become caught up in creating an account of my experience as an early career researcher because this has been the only way I can begin to make sense of what is involved in such a process. Again M. C. Bateson's words support me in coming to describe my slowly forming *how*: 'stories and reflections strung together to suggest a style of learning from experience' (M. C. Bateson, 1994, p.11).

While stuck in perpetual feedback loops, as I flip-flop between action and doubt



"research what you want, how you want" has become a reassuring chant and gathered a rhythmic momentum

Research what you want, how you want

Research what you want, how you want

fusing with a part-remembered poem by Robert Louis Stevenson which, as a child, I had always said as quickly as I possibly could

Faster than fairies, faster than witches

Bridges and houses, hedges and ditches

but at some point it dawned on me

this was going to be

a slow study.

It is becoming evident, stepping into time with people while they tell their stories of experience over an extended period demands working at a slow pace. Transcribing Paula's interview was a shockingly slow process and my research design heralds many more transcription hours to come. Developing the methodological awarenesses required of a PhD study while constantly discovering possible lines of inquiry, myriad theoretical frames and both established and evolving philosophical positions is a slow, slow process too. Thinking and writing it all into some kind of hopefully coherent stream – well. I am also continuing to work full time as I study so by necessity am stitching this new dimension into my already Batesonesque multiplied life (M. C. Bateson, 1990). As I sit here at seven o'clock on a Sunday morning, knowing this window for writing will soon close, I relate to another of M. C. Bateson's observations: 'we talk about our time as if it were a flower bed continually invaded by wild flowers that we are reluctant to pull out' (M. C. Bateson, 1990, p.178).

Working at Home
He likes
to have the radio on.
I like
to be able to hear the clock ticking.
He likes
to sing and whistle.
I don't.
I can't get on because he is making so much noise.
He can't get on because my quietness is so loud.
(Me, Digital Diary, January 2018)

However, she also explores the 'economies of combination' (p.181) and 'mutually enhancing' activities (p.185), which support different ways of thinking about life experiences in order that apparently distinct patterns might be seen as contributing to a complex whole. I notice I am drawing on established life practices which support being slow, with yoga and walking steadily becoming methodological tools complementing the meditative qualities I require to

listen and re-listen to recordings of interviews, to immerse myself in forming transcriptions, to be calm with the stories of others and relinquish the need to grasp hurriedly for meanings. Banerjee and Blaise (2013) researched the air in Hong Kong through 'becoming-with' (p.240) practices, seeing walking as a way of engaging with their data, air. Wylie (2005) walked alone to 'activate a space in time' (p.234) in which he could explore philosophical and methodological interests connected to self and landscape. Similarly my slow physical practices support the forming and settling of ideas, so becoming the warp then the weft of the fabric of my study. I notice being slow underpinning different ways of knowing and different ways of communicating my knowing.

There is a demand in the teaching profession to isolate *what works* in order to solve problems. Once *what works* has been found, described and labelled it is assumed the remedy can be administered. While the premise of such evidence-based attempts to study education and make change happen in the practices of teachers is contested, it remains attractive to policy makers and research funders alike (Biesta, 2007). The Shanghai Exchange Project perhaps echoes a *what works* agenda, making the assumption that if all teachers in England were to teach in the Shanghai-style and adopt a mastery pedagogy, the problem of our global underachievement in mathematics would be solved. Stengers (2018) questions fast approaches to social research, those underpinned by hard science principles, examining the limits of their quest to isolate 'one type of success' (p.64). For me, the *what works* agenda in education seems to be an approach to knowledge creation built on fast principles and when I think of Paula's story of development over time, and Ma's (2010) detailed study of different ways of understanding fundamental mathematics, something jars.

Watts (2019) reports on a research finding that visitors to art galleries and museums spend an average of 27.2 seconds looking at great works of art. Slow Art Day, an annual global

initiative nurtured in response to this finding, invites people to take time to pause, and look closely at art. The suggestion is, when we engage with art works at a slower pace, when we take our time to look, we notice differently. Ulmer (2017) explores possibilities for 'a slower way of scholarly *being*' arguing studies driven by such a premise might be 'differently productive' from those conducted with faster epistemological and ontological foundations (p.201) and Stengers (2018) argues for researchers to 'learn to appreciate the landscape that situates them, instead of passing through it at top speed' (p.47). Researching with a narrative view is appropriate when a researcher wishes to focus on experiences and the meanings attributed to those experiences, when there is a desire to engage with the complexity of the personal and social aspects of people's lives set against shifting landscapes of time and place. Ulmer (2017) makes a distinction between "slow" and "Slow": 'movements that are "slow" involve issues of knowing across time' while '"Slow" movements involve issues of being across time' (p.201). Attending to the experiences of others, and indeed our own, in order to map new territories is a slow process on both levels so, I suggest, research of a narrative nature demands a preparedness to both know slow and be slow.

M. C. Bateson (1990) frames encounters between living beings as caretaking ventures. She argues caring requires 'a quality of attention, a total commitment to looking and listening' and notes the necessity of 'slowing down for care taking' (p.158). In working with Paula's story I was struck by the care I needed to take with the sharing of her life. Some words and phrases in early drafts discordantly clanged and had to be edited and re-edited until they settled into Paula's rhythms and ways of telling. Craig and Huber (2007) draw on the work of Clandinin and Connelly, who draw on the work of Dewey (Clandinin and Connelly, 1995; Connelly and Clandinin, 1999; Clandinin and Connelly, 2000), to explore a relational way of knowing and the inward, outward, backward, forward movements across the narrative inquiry space involved in coming to know something of the representations of the reality of teachers in their own terms. These temporal and spatial shifts require attentiveness to wonderings and

ponderings, to richness and depth, to 'relational reverberations' (Craig and Huber, 2007, p.225). Narrative knowings come slowly; beads cannot be strung together until there are beads to be strung. Narrative research projects are designed over time, people are known and know themselves differently over time, their experiences and their interpretations of these experiences build and shift and settle over time. It seems a narrative knowing and the reality constructed around that knowing are evolutionary and, I suggest, slowness and narrative inquiry symbiotic.

Back at the beginning of this project, back when I was in my early forties, Alf told me a story of a friend whose father took a delivery of a tonne of sand. The sand was left in a heap at the front of the house and Alf's friend and his brother were instructed, by their father, to move the sand from the front to the back of the house, a bucket-full at a time. I do not recall if Alf told me how long it took the two boys, who I imagine to be about ten years old and living in the house I did at that age, but I suspect it took a long time and was about much more than the substantive topic of the moving of sand.

I See

With a tentatively growing conviction of what I wanted to research and how I might do so, I started to interview postgraduate teachers and

> I felt frustrated by their responses to my questions and to the content of the interviews – they were not saying what I wanted, not changing in the ways I wanted them to. Looking back, I think I now see they were telling me the stories that were relevant to them in response to my questions – that's all they could do. (Me, Digital Diary, October 2015)

At the time, and with a degree of blissful unawareness, I set these frustrations to one side and presented some of my initial thoughts at a conference and then in the proceedings of that conference (Ormesher, 2014). However, over time, I found the tensions epistemologically and ontologically unsettling; they have lingered and now require attention.

To begin with, when unanticipated responses came during interviews, I reframed my questions, restated the purpose of my research and re-explained what I wanted to get at. Between interviews, back in the safety of the glow of my computer screen, the sense of there being a correct question to ask, in order to get the correct story, led to a flurry of drafting and redrafting of interview questions with the potential for never ending tweaks – a curl here, a flick there

~~How strongly do you feel you are a primary maths specialist?~~

~~What does being a primary maths specialist mean to you?~~

~~Do you see yourself as a primary maths specialist?~~

As I became more methodologically minded I started to see my assertions and hyperactive question coiffuring as revealing something about my notions of knowledge and reality. The sense the teachers were not saying the right things houses the implication I was interviewing

with an expectation of what would be said in response to my questions, as if an interview would entail going through the motions of replicating an already written script. If I looked hard enough I would find the knowledge proving a version of reality already known to me, what had become, unnoticed and unquestioned, a master narrative of becoming and being a primary mathematics specialist. Kvale and Brinkmann (2009) use the metaphors of mining and travelling to illustrate different epistemological positions on interviewing. When reading their work I cast myself as a traveller, learning something of the worlds of my fellow travellers as I walked alongside them over their first year as primary classroom teachers. Yet here I was, in the throes of interviews, digging grubbily for correct answers and getting annoyed when I could not unearth them.

When I listen back to these early interviews, I feel uncomfortable, inwardly squirming when I hear myself overstating my position and trying to control the interview content. I notice I have a tendency to repeat back what people have said, so as to make sure I have understood what they mean, and then, when I assume we have established a shared understanding of what we are talking about, I say "I see" with gusto. I am also prone to using the phrase as an interjection, an encouraging 'back-channel' utterance (Riesmann, 2008, p.31) indicating I am there, I am with them and their story and following what they are saying. And I use it a lot. While possibly a fairly standard conversational tick, in a research interview context it is perhaps a verbal manifestation of unwittingly held beliefs about the nature of knowledge and reality, my inner naïve realist made manifest. Early in my PhD study I had been quick to reject a positivist stance as fitting for the complexity of social research but I suggest my thoughts and actions reveal a position in alignment with this paradigm: there is an existing reality about being a primary mathematics specialist out there and it can be observed, described, generalised.

However, my diary entry also indicates a glimmer of different awareness. With some distance in time from the experience I was able to begin to be open to another possibility: perhaps

there was nothing wrong with the questions or the answers; perhaps this was just how things were for these teachers at this time. Here there is recognition of people having their own stories; their truths would not be mine just as my truths would not be theirs. Suddenly there were many ways – not right or wrong ways, bigger or better ways – just ways. Unexpectedly, in my acceptance of the 'loss of certainty in what is known and ways of knowing' (Usher, 1996, p.25) my view of the nature of reality and knowledge shifted with a lurch to the postmodern. One part naïve realist to one part positivist to one part postmodernist: a diverse philosophical melee to find myself wrestling with.

I observe my early, unquestioned thinking in what Holstein and Gubrium (1995) describe as the 'vessel-of-answers approach' (p.8). Here an interviewer's role in knowledge production is seen as a passive one; once the trick of asking the right questions is achieved, the interviewee will spew forth 'the unadulterated facts and details of experience under consideration' (p.8) and this will somehow stand as the truth on the matter. In contrast, a postmodern view of the world questions what might be considered as reality and so reframes my consideration of the interview process (Fontana, 2003). In line with the thinking of Holstein and Gubrium (1995), Fontana offers a view of interviewers and interviewees playing an active role in making meaning with both taking part in a process of constructing knowledge through their collaboration. This perspective is redolent of Mishler's (1991) focus on interviews 'as a form of discourse between speakers' (p.7). Crotty (1998) posits constructionists make meaning by working with the world and the objects in the world; in narrative inquiry those objects in the world are our experiences and the stories we create to communicate those experiences. As Chase (2005) explains:

> Narrative is a way of understanding one's own and other's actions, of organizing events and objects into a meaningful whole, and of connecting and seeing the consequences of actions and events over time (p.657).

Issues of time and temporality are acknowledged as significant features of narrative structures, with stories of experience organised into beginnings, middles and ends and threads of causality linking chains of events (Elliott, 2009). This structure is clear and compelling in Paula's complete story of her development as a primary mathematics specialist yet it was less obvious in the stories of experience of the early career teachers I interviewed, perhaps because theirs were/are narratives still under construction.

From the postmodern perspective, working with interviews asks for an engagement with *how* knowledge is constructed as well as with *what* knowledge might be offered (Fontana and Prokos, 2007, p.86). The *hows* 'refer to the interactional, narrative procedures of knowledge production' while the *whats* 'pertain to the issues guiding the interview, the content of the questions and the substantive information communicated by the respondent' (Holstein and Gubrium 1995, p.4). In beginning to question my epistemological and ontological positioning, I notice my attention shifting to the *hows*. Riesmann (2008) suggests tellers might use stories of experience to: remember, argue, justify, persuade, engage, entertain, mislead, mobilise others, foster a sense of belonging, inform, cogitate, work out, share. Holstein and Gubrium (1995) observe 'the respondent not only conveys information about his or her life but simultaneously activates and manages – narrates – what is accessed and the diverse meanings that address relevant issues' (p.31).

I am left wondering exactly what I can see when researching the experiences of others.

> A flower is relatively small. Everyone has many associations with a flower – the idea of flowers. You can put your hand out to touch the flower – lean forward to smell it – maybe touch it with your lips almost without thinking – or give it

to someone to please them. Still – in a way – nobody sees a flower – really – it is so small – we haven't time – and to see takes time, like to have a friend takes time... So I said to myself – I'll paint what I see – what the flower is to me, but I'll paint it big and they will be surprised into taking time to look at it – I will make even busy New Yorkers take time to see what I see of flowers... Well – I made you take time to look at what I saw and when you took time to really notice my flower, you hung all your associations with flowers on my flower and you write about my flower as if I think and see what you think and see of the flower – and I don't (Georgia O'Keefe, 1939).

Oh … OK

> **I challenged Izzy about not all children getting the chance to think mathematically – I am worried my challenge was inappropriate. (Me, Digital Diary, November 2016)**

I was interviewing Izzy when we hit a topic where her way of thinking about mathematics education was different to mine. There was an uncomfortable moment but we continued with the interview, I brought it to a close after the agreed amount of time and we parted on good terms with plans to be in touch about the next interview soon. But there never was a next interview because Izzy decided to withdraw from my research project. The clash of opinion is really quite small and in some ways when I listen back to the recording and read the transcript I can nearly convince myself I imagined it and have made a mountain out of a molehill:

> Izzy: The maths has just changed recently it must be in the last year or so
>
> Me: Ok and have they given you .. have you had training to help with that change?
>
> Izzy: We've had a couple of staff meetings but they'd changed it before I started so I'm sure they would have done lots before
>
> Me: Ok and were the staff meetings on the running of it?
>
> Izzy: They were on greater depth stuff so what we could do to push on the more able ones
>
> Me: So what is the take on greater depth how would you describe it, is that the …?
>
> Izzy: It's the … reasoning investigation type stuff I think

Me: Yes … how … does that sit with you ok . with the thinking about the maths specialist stuff . does that … I don't know there's that worry I have I suppose that only some children are getting reasoning stuff

Izzy: Yes

Me: And some of the stuff we looked at last year was very much about .. that is what maths is … the reasoning stuff

Izzy: Oh … OK

Me: And if only some children are getting to do reasoning is that . I wondered how that sits with you?

Izzy: Well I feel like it's definitely … for some of my children they wouldn't really know what to do . they wouldn't understand the concept of reasoning and trying different things out I don't think … it's too complex I think so I think it's definitely a step on from the basic concept I would say

Me: So it works for your children sort of thing

Izzy: Yes

Me: So you're happy that it works

Izzy: Yes but it might not for every class I don't know

Me: Yes that's true but for this setting that feels ok

Izzy: Yes

(Izzy, Interview, November 2016)

Oh … OK

This tiny utterance carried a great deal of clout. I think a flash of either indignation or contempt accompanied it from deep within dark brown eyes but of course my sound recorder cannot help me with my dramatic meanderings. And then, to add insult to injury, I asked three times for confirmation this was what Izzy really thought:

It works for your children?

You're happy that it works?

It feels ok?

YES

as if in keeping asking I might be able to persuade her to come round to my way of thinking. Well good on you for sticking to your guns Izzy. Three times! Plain rude. Sometimes I cannot help but wonder if Izzy ever discussed this episode with anyone and if so what she might have said. In the manner of Clough's (2004) eye-poppingly exquisite account of his clash with Lolly, I imagine the phrases "old bag" and "thinking she's got the right to tell me what I should be doing in my classroom" and "poking around in my life for her benefit" featuring.

This occurrence, this interviewing incident has stayed with me. It has cropped up as I have read and thought and written, and read and thought and written, surfacing again in one of my diaries some fourteen months later:

> It was because I judged her that I have a bitter taste. I presented the notion that she was wrong. I was on her territory, invited into her classroom to hear her story and I judged it. Learn to have a conversation with not at. Learn to leave behind

> what I think I might know about this person and their practice and their mathematics and just listen. (Me, Digital Diary, January 2018)

As previously discussed, a person so inclined does not have to step far into the world of narrative research to learn human beings have a tendency to create and link storied events in their lives into narratives of causality:

I challenged Izzy about her views

She was insulted and withdrew from the study

I developed my practice as a result

but perhaps if I spoke to Izzy I would come to a new version of reality about this happening. Or if I was re-presenting this story for a different audience maybe I would tell it differently. This point of departure brings me back to the *hows* of narrative inquiry: if establishing accounts of people's experiences is so slippery and mutating should we bother? Bolstered by this quotation from Riesmann (2008) 'stories reveal truths about human experience' (p.10) my response is still a resounding yes, although, I am becoming more aware of multiple and malleable truths, more tentative and questioning about what I may or may not claim from accounts of experiences lived in the past. This slow and recursive process of coming to know differently, again serves to light up some of the philosophical underpinnings of narrative inquiry. The theme of the loss of certainty echoes with the verisimilitude of one re-storied interpretation resting not so much on there being one more valid or more correct version than another, but whether the interpretation offered conveys something of a reality situated in a particular place and time and holding meaning which is 'locally comprehensible' (Holstein and Gubrium, 1995, p.9).

Another issue or theme recognised as inherent to narrative inquiry also surfaces and is to do with the way in which stories are re-presented. The sensitivity I required in taking care of

Paula's story is lit differently here. While I treated Paula's story as a whole, with Izzy I have zoomed in on a particular moment and enlarged it. I hope I have worked with it sensitively still but I am also aware I have applied some artistic licence in order to draw attention to the, unexpected on my part, complexity of conducting research close to people. Is this allowed? This active and willful manipulation of interview data to highlight a particular truth? Perhaps it is more of a fictionalisation not to do so, important instead to be upfront about the bearing the researcher has on the construction and communication of research findings rather than hiding behind a false front of neutral objectivity. The view of narrative inquiry as a creative act is explored by Freeman (2007). He suggests the social scientist has a duty to develop research texts in order that they might stand to serve both the content and the people they tell of. In this respect he sees narrative inquirers being imaginative and artful in their work as a necessity. The call to be imaginative and artful is another one of those unexpected requirements troubling the previously clearly deliniated edges of what I expected doing research to involve. Speedy (2008) offers a number of criteria for readers of narrative texts to support their engagement with, and interpretation of, such studies. Her view is narrative research texts might have 'asthetic merit' and be '*not boring*' (p.56, original italics). However, Reed and Speedy (2011) make a distinction bewteen a turn to artfulness for reasons of 'embellishment or decoration' or for reasons supporting the legitimisation and generation of 'new forms of knowledge' (p.111). From my point of view, I am finding playing with the construction and re-construction of stories an absorbing and enjoyable process and beginning to notice re-presentational choices having the potential to support the development of different ways of seeing and attending to experience.

Chase (2005) discusses the bedrocks of narrativity I am attempting to light up too. She recognises narrative inquirers exposing their vulnerabilities by reporting troubling research moments and offers a counter argument to accustations of self-indulgency. She suggests there is a need for researchers to develop an understanding of themselves, so they might in

turn bring understanding to bear on their interpretations of the stories of others, so supporting their readers in understanding their re-presentations.

Understanding of self is a central aspect of recent research in the field of mathematics education. Chapman, Kastberg, Suazo-Flores, Cox, & Ward (2020) argue self-based methodologies, such as self-study, narrative inquiry and autoethnography, provide insight 'about the professional self of mathematics teacher educators' and that these insights have, in turn, the potential to 'reveal knowledge important to teacher education' (p.158). Researchers recognise the potential such methodologies hold for creating expansiveness in their practices, with the articulation of contradictions between lived experience and previously unnoticed deeply held beliefs and values, made possible. Research projects are shaped and re-shaped in response to new noticings stemming from the different attending researchers do as they inquire into the lives of others and as the line between the researcher and the researched blurs (Chapman et al., 2020). Chapman argues through such studies 'new understandings, meanings and experiences emerge' (Chapman, 2020, p.21).

Dana Cox and Elizabeth Suazo-Flores, two mathematics teacher educators / researchers, describe their narrative inquiry research (Chapman et al., 2020) and their descriptions resonate with my developing narrative understandings of teachers' lives and my experiences, and the connections between the two. Cox has worked on a number of narrative inquiry projects: with teachers seeking to develop leadership of mathematics within their schools; with teachers working to establish a fluid use of technical mathematical vocabulary; with teachers as mathematical problem solvers and with teachers designing mathematical contexts for learning. She explores her development as a researcher and comes to view narrative inquiry as an 'empathetic methodology' (p.171). She questions how far she can speak for the teachers she works with, observing the only voice she feels comfortable using is her own and seeing her purpose as to 'share the impact of the stories told' (p.171) rather than to interpret what teachers shared with her. Suazo-Flores describes her process of

learning to work as a narrative inquirer in her explorations of the 'personal, practical knowledge' (p.173) of teachers of mathematics. She explains how narrative methodology is alive and kicking at every stage of a research project and how coming to be her 'authentic self' (p.173) as she talked to participants, analysed data and reported her findings, was an important part of her learning.

It would seem then, such work has the potential to contribute to the field of mathematics teacher education, with the associated possibility of supporting positive change in mathematics classrooms. A review of literature (Chapman et al., 2020) shows although some attention has been given to the use of narratives as a method of data collection and/or analysis, the application of narrative inquiry 'as a methodology in mathematics teacher educators' learning or enquiry of themselves' (p.168) is limited, with any such learning which may have taken place often going unarticulated in published studies. Echoing Chase's recognition of narrative inquiry research being open to accusations of self-indulgency (Chase, 2005), Chapman et al. (2020) consider the pressure upon mathematics teacher educators / researchers to be recognised as academics through the publication of their work in academic journals, as a reason for learning of the self to be omitted so leaving it largely unacknowledged as research in its own right, even though such learning could raise 'implications for improvements of teacher education in general' (p.182).

Chase (2005) also makes the point that narrative inquirers seek to challenge the notion of an 'invisible omniscient author' (p.666) and, for me, this challenging is important for the methodological coherence of a field of inquiry setting out to notice the sometimes unseen grand narratives flourishing in our daily lives. Further still, I propose, in order to explore the loss of certainty, a degree of examination of the experiences which might promote such a loss is helpful. Such examination has the potential to shed light on the process of learning from experience.

So, whether or not I have, consciously or unconsciously, conflated a sequence of events into a developmental narrative to dramatize, make sense of, paint myself in a certain light and so postmodernly forth, this communication with Izzy, along with the bitter taste it left, has played some part in prompting change: I have learnt from the experience. This feels relevant if I intend to claim, as a result of PhD level study, I have made strides in learning how to construct and communicate accounts of aspects of peoples' lives, so others might be informed differently on the subject of mathematically minded early career primary teachers. I am not so much of a naïve realist to think Oh … OK is the only event contributing to this learning and I even realise Izzy leaving the study was not the main catalyst for either the change or the desire to retell the story. In the second it took for Izzy to say "Oh … OK" I knew I had crossed a boundary and owing to the practices of social research, a fragment that could have been lost in the data flow of daily life could be re-listened to and re-lived.

Perhaps more than matters of epistemology and ontology the axiological realm is relevant here. In reading the exacting detail offered by Mertens (2015) and the ethical guidelines from the British Educational Research Association (BERA, 2018) I thought I had all of my ethical bases covered. As part of my ethics application, I created participant information sheets and consent forms, submitted them, gained approval (see Appendix 3). I then handed them out, got them signed, collected them in, filed them. I had helpful conversations with learned colleagues about the ramifications of qualitative studies of the narrative kind. I was careful to design and negotiate a process of data collection both manageable and flexible for the teachers I hoped to work with because an unreasonable workload is a condition of their profession (DfE, 2019) and I felt compelled to limit how much I asked of their time. I read about the different ways in which research participants might be considered vulnerable even if they are adults considered able to consent freely to being research participants (Wiles, Crow, Charles, and Heath, 2007; Le Maistre and Paré, 2010) and factored new awarenesses into my plans. As a teacher educator intending on working with postgraduate and newly

qualified teachers, I knew there was an imbalance of power and eliminated research methods involving observations of teaching or talking to children or colleagues from my design as I did not want to position myself as a potential judge of their teaching. As my design meant I would be extending my relationship with postgraduate teachers into their newly qualified teaching year, I was conscious of being clear about when the project, and therefore relationship, would end. And then I compromised an unexamined ethical code of communication by being over opinionated and valuing my views over Izzy's. All the form designing and reading had not prepared me to act well in a situation when the person I was interviewing held an opinion in direct conflict with my own. Perhaps life should have prepared me but while in everyday conversation with a friend points of disagreement can nurture interesting debate this did not happen that day between Izzy and I. It seems important to notice this because, as a researcher interested in learning about the experiences of others, my aim is to open dialogue up so I might hear their stories, rather than close it down. As Holstein and Gubrium (1995) note: 'the objective is not to dictate interpretation but to provide an environment conducive to the production and the range of complexity of meanings that address relevant issues' (p.17).

Josselson (2007) suggests, when coming to know in relational research, 'every aspect of the work is touched by the ethics of the research relationship' (p.357). She proposes, as well as the explicit contract assuring informed consent, anonymity and protection from harm, there is also an implicit contract, the terms of which are difficult to predict. As a result of this unforeseen experience I am learning to let others speak and to pause in order to allow space for the development of thoughts and ideas about teacherly practices of mathematics through our communications, our meetings of minds. I do not seek to avoid differences in opinion, but I am learning to be with such moments more carefully, more mindfully. I had not considered it so previously, but listening is an ethical, relational, practice and part of the

implicit contract between researchers and participants. I notice I am subordinating talking to listening and when I do speak, I listen carefully.

The complex and delicate narrative terrain has been thoroughly mapped with many before me finding and defining their place upon the landscape. These experiences I communicate, these stories of my process of becoming a researcher can all be plotted onto these now well-trodden trails where narrative is recognised as 'both the method and the phenomenon of study' (Pinnegar and Daynes, 2007, p.5) and layers of stories are reminiscent of Russian dolls each housed inside another. I notice I am drawn to this mode of inquiry because narrative methodology tolerates a state of flux and supports myriad connections. Lived lives shift, intertwine, disconnect, re-connect. They do not stop and start neatly the way a laboratory experiment might.

Clandinin and Connelly (2000) observe, in narrative inquiry studies, we are forever in a process of '*becoming* rather than *being*' (p.145, original italics) as we are always learning from our experiences. This view of learning from experience calls to mind the work of John Dewey, a name in a string of names, linked to strings of words:

John-Dewey

learning-from-experience

Lev-Vygotsy

zone-of proximal-development

Jean-Piaget

assimilation-accomodation

Jerome-Bruner

iconic-symbolic-enactive

standing for aspects of the theorised learning process and all part of my teacherly knowledge base.

Clandinin and Connelly are influenced by Dewey's views Clandinin and Connelly, 1995; Connelly and Clandinin, 1999; Clandinin and Connelly, 2000). They see experience as *continuity*: 'experiences grow out of other experiences, and experiences lead to further experiences… the imagined now, some imagined past, or some imagined future – each point has a past experiential base and leads to an experiential future' (Clandinin and Connelly, 2000, p.2, original italics). Similarly, M. C. Bateson (1990; 1994) invokes Dewey in her books which tell stories of learning from experience as we improvise our way through our lives. She notes: 'because it is impossible to step into the same river twice, one can learn from each return' (M. C. Bateson, 1994, p.44). Biesta (2007), in his rejection of the *what works* agenda, also draws on the pragmatic philosophy of Dewey. He explores Dewey's notion of a 'transactional theory of knowing', which concerns the double relationship between actions and consequences, proposing we use existing knowledge constructed from previous experiences to act with intelligence when new problems are encountered. This continuous nature of experience means there cannot be an end, a final point in which a perfect conclusion is reached and this reasoning forms the basis of Biesta's (2007) argument that we can only talk of what 'worked' and never what 'will work' (p.16). In Dewey's (1958) words:

> A relationship of cause-effect has been transformed into one of means-consequence. Then consequences belong *integrally* to the conditions which may produce them, and the latter possess character and distinction. The meaning of causal conditions is carried over also into the consequence, so that the latter is no longer a mere end, a last and closing term of arrest (p.371, original italics).

Dewey's ideas of continuity indicate why grand narratives with their fixed answers might be treated circumspectly. He proposes we might keep our 'ends-in-view' as we hypothesise our way forward (Biesta, 2007, p.19). My experience with Izzy has highlighted the responsibilities that come with being 'in the parade we presume to study' (Clandinin and Connelly, 2000, p.81) and, according to Dewey, may support me in acting intelligently in the future.

Not Power

The stimulus-response psychologist typically confines his attention to sequences of interchange so short that it is possible to label one item of input as "stimulus" and another item as "reinforcement" while labelling what the subject does between these two events as "response." Within the short sequence so excised, it is possible to talk about the "psychology" of the subject. In contrast, the sequences of interchange which we are here discussing are very much longer and therefore have the characteristic that every item in the sequence is simultaneously stimulus, response and reinforcement. A given item of A's behaviour is a stimulus insofar as it is followed by an item contributed by B and that by another item contributed by A. But insofar as A's item is sandwiched between two items contributed by B, it is a response. Similarly A's item is a reinforcement insofar as it follows an item contributed by B. The ongoing interchanges, then, which we are here discussing, constitute a chain of overlapping triadic links, each of which is comparable to a stimulus-response-reinforcement sequence. We can make a triad of our interchange and see it as a single trial in a stimulus-response learning environment.

If we look at the conventional learning experiments from this point of view, we observe at once that repeated trials amount to a differentiation of relationship between the two organisms concerned – the experimenter and his subject. The sequence of trials is so punctuated that it is always the experimenter who seems to provide the "stimuli" and the "reinforcements," while the subject provides the "responses." These words are here deliberately put in quotation marks because the role definitions are in fact only created by the willingness of the organisms to accept the system of punctuation. The "reality" of the role

> definitions is only of the same order as the reality of a bat on a Rorschach card – a more or less over-determined creation of the perceptive process. The rat who said "I have got my experimenter trained. Each time I press the lever he gives me food" was declining to accept the punctuation of the sequence which the experimenter was seeking to impose.
>
> It is still true, however, that in a long sequence of interchange, the organisms concerned – especially if these be people – will in fact punctuate the sequence so that it will appear that one or the other has initiative, dominance, dependency or the like. That is, they will set up between them patterns of interchange (about which they may or may not be in agreement) and these patterns will in fact be rules of contingency regarding the exchange of reinforcement. While rats are too nice to re-label, some psychiatric patients are not, and provide psychological trauma for the therapist! (G. Bateson and Jackson, 1964, cited in Watzlawick, Bavelas, and Jackson, 1967, pp.54-56).

My first attempt at interviewing, with Paula, had made the whole business appear to be a straightforward one. I provided a stimulus and Paula gave a response and her response was exactly of the nature I had anticipated as a result of my stimulus. Apart from a couple of reinforcements and the occasional further stimulus, Paula's retrospective version of her lived and established reality flowed whole, complete. Moreover, we seemed to have a shared notion of what being interviewed would be like, seamlessly donning complementary role definitions. Working with early career teachers over a long period of time was turning out to be a very different experience. Perhaps I should not have been surprised by this: mining for a fully constructed story lying close to the surface or travelling alongside people in the process of constructing narratives about their lives were bound to be different experiences and require the evolution of different ways of being.

One of the things I did not take into account when interviewing Izzy was the significant change in our relationship, or our role definitions. Teacher educators and postgraduate teachers working together to recognise assumptions about learning and teaching and to consider these assumptions from different perspectives, are recognisable features of our PGCE course. Learning opportunities requiring mathematical reasoning only being offered to children considered of high ability is a familiar topic for such discussion.

Prior to the interview I had been Izzy's university tutor and at that time, initiating a discussion about our actions in our classrooms may have been a fitting thing for me to do. A successful job interview, graduation ceremony and summer holiday later, Izzy was a teacher with her own class and classroom. She had invited me into her world but I had failed to recalibrate our relationship. When the familiar topic of "who gets to do the sort of classroom mathematics which requires reasoning?" came up, rather than encouraging discussion inviting exploration of Izzy's experiences, as a narrative researcher might, I slipped into tutor mode, bestowing myself with 'dominance' and leaving Izzy with the role of dependent. Perhaps Izzy's look, her unwillingness to accept the view I was trying to impose and her subsequent withdrawal from the study were expressions of her 'initiative' and 'dominance' (G. Bateson and Jackson, 1964, cited in Watzlawick, Bavelas, and Jackson, 1967, pp.54-56).

After Izzy I was more cautious. I became wary of over stating my views and closing down talk. However, the nature of a conversation between two people calls for a need for both to participate in some way and I needed to shape these research-purposed conversations in order to explore the *whats* of being a primary mathematics specialist. I turned to experienced others and found Seidman's (2013) suggestions helpful. I adapted some of his structures and made loose but intentional frameworks for subsequent interviews: I used time frames of before, during and after (see Appendix 1) to mould our conversations and practised phrasing questions to support exploration of the detail of experiences. I also started to use my tendency to repeat the words of others differently. Having established this was a fairly futile

epistemological pursuit in terms of ensuring we were "seeing" the same things in the same way, this communicational pattern took on a new attribute: it felt like a low risk strategy, a safe move. It seemed logical there could not be much contentious in saying what the person I was interviewing had just said so I started to retreat behind their words. In a sense, because my previous communications had proved troublesome, I was trying not to communicate. However, as Watzlawick et al. (1967) observe:

> no matter how one may try, one cannot *not* communicate. Activity or inactivity, words or silence all have message value: they influence others and these others, in turn, cannot *not* respond to these communications and are thus themselves communicating (p.49).

And, sure enough, it transpired my presumed non-communicative repeat back move acted as a stimulus, often resulting in the teachers giving further detail of the experiences I was hoping to hear more about.

Around the same time I arrived at a similar destination by a completely different route. While other interviews had been less traumatic than the one with Izzy, hearing my fairly continuous "I see-ing", "oh yes-ing" and "that's really interesting-ing" when re-listening to and transcribing them, was still uncomfortable. I, somewhat embarrassedly, acknowledged my tendency for compulsive reinforcement and learnt, slowly, to stop myself. When I noticed habitual but unnecessary utterances beginning to form, I made the choice to not let them escape and become said. I noticed the absence of such communications sometimes leaving a gap and heard these gaps denoted by pauses in our dialogue. I was astonished to find these momentary silences also acting as a stimulus: as long as I did not provide a response the person I was interviewing would. *Not* communicating was a clear communication: 'I have nothing useful to say but would love to hear more of your experiences'.

It seems, as a result of some uncomfortable experiences as a novice researcher, I was in a position to act with greater intelligence although I have to admit there was something accidental and unplanned about the changes in my patterns of communication. Watzlawick, Weakland and Fisch (2011) explore questions of persistence and change. They propose that employing 'weird, unexpected, and uncommonsensical' strategies, rather than doing 'more of the same', can result in change (p.80-81). A Deweyian interpretation might be that I am establishing new habits, which are cutting across old ones; he notes 'instability, novelty, emergence of unexpected and unpredictable combinations' as features of such development (Dewey, 1958, p.281). M. C. Bateson's (1990; 1994) notion of improvisation is another helpful lens for focusing on accidentally intelligent action. While there are many ways of examining the process of change from a theoretical perspective, just like Paula in her first year of teaching, initially I was going on instinct with insight coming later.

Another shift in perspective has come in the way I now consider the interactional nature of interviews. When I engage in, think of and discuss interviews I notice my tendency to use the words "conversation" and "interview" interchangeably, as if they are one and the same. This position is contested in the field of qualitative research: interviews, even in-depth ones, are not conversations (Legard, Keegan, and Ward, 2003). Learning to keep particular things unsaid, the deliberate use of silence as a prompt, asking people to sign a consent form before talking to them, are all examples of how these are not conversations in the everyday sense of the word. However, there is something about interviews that feels conversational and I can imagine that now I am conscious of the move to communicate by not communicating, this behaviour will become part of how I converse generally (although consent forms probably will not). Now I have recognised the *not* move and had some practice with it, I am in a position to make more conscious choices and can act to open up the 'conversational space' (Speedy, 2008, p.xiii) I once tended to close down. Legard et al. (2003)

observe interviewees 'respond positively where the interviewer displays a sense of 'tranquillity' – an inner stillness which communicates interest and attention and which is accompanied by a feeling of being comfortable with the interviewee and the situation' (p.143). I cannot yet claim tranquillity but I do notice a change in my behaviour and I can communicate about that change in behaviour. In the space left by *not* talking I am free to listen.

A Piece of Writing about Reflexivity I

In my earlier rounds of reading when I came across the idea of reflexivity described in a research article or chapter of a book I found it difficult to get a feel of it, unsure how this state of being could be an actual disembodied thing, a research or literary device, picked up or put down as required. It is not that writers did not communicate it well it is just that I think it has only made sense in doing it and then recognising that I have been doing it. Now I am re-reading the library I have amassed, articles and chapters about reflexivity feel more tangible because I can think – oh yes – that is just like when that happened with such and such and I said this and they explained that and… things shifted. The piece of the puzzle that has vanished without a trace is how much or not those early readings shaped what I have then gone on to do and how I think about my work. And now I have a number of choices. I could continue chicken-and-egging in a nature/nurture debate. I could tell you about what others have said about reflexivity and report their views, their findings, but they say it much better than me so you may want to turn to, for example, Berger (2015), M. C. Bateson (1990), Bruner (2004), Elliott (2009), Etherington (2007, 2009), Franks (2016), Gemignani (2014), Josselson (2007) or Speedy (2008). I could give you some stories from my work and show you "look, this is me being reflexive" but I think I have hinted at quite a lot of that already and I am assuming you probably do not need me to signpost more of those moments with a reflexive arrow. I think an interesting, and challenging, avenue to explore would be how working in a reflexive way might be helpful when researching slow. I know this to be more interesting and challenging because while I could churn out a couple of thousand words if I took either of the other options I am stumped about what to write, right now.

Negative Space

Earlier I talked about my feelings of frustration when interviewing early career primary mathematics specialists because they were not saying the *right* things. I focused on my existential angsts but I also felt some discomfort about the substantive topic of teaching mathematics: I found the early career teachers tended to focus on establishing a classroom culture, affective associations, challenges and hopes, when talking about their daily classroom experiences of teaching and learning primary mathematics (Ormesher, 2014). I was surprised to find little of their talk was about getting to grips with the mathematical skills and concepts they were teaching their children. In those early interviews I was expecting to hear something I had decided was the *right* way of talking about classroom mathematics. I recognise my observations in T. Brown and McNamara's (2011) findings:

> in reflecting on their own experiences of mathematics, the students in our study generally seemed unable to articulate their understanding except in affective terms. For those interviewed prior to initial training, mathematics was often conceptualised as a bad school experience. For those later on in the course mathematics was subsumed within the discursive practices of teaching as perceived within the broader primary education space. That is, mathematics was understood primarily through administrative filters such as those to do with classroom organisation. Mathematics did not acquire much of a subject identity in terms of its content. Teaching strategies, meanwhile, were drawn from a more general pool of teaching strategies applied across the various subjects (p.25).

It seems primary mathematics teaching is often talked about from a deficit position. I read about teachers with 'fear, loathing and ambivalence toward learning and teaching mathematics' (Itter and Meyers, 2017, p.123); teachers who fail to recognise the relevance of

subject knowledge (Allen, 2010); and teachers who give a 'tragic tale' when they talk of their mathematical identity (Kaasila, 2007b, p.213). At one time I think I would have agreed with this deficit view: people embarking on their careers are not quite good enough, not bringing quite the *right* experiences, the *right* knowledge, to their teaching careers in general and mathematics education in particular. I was not open to recognising the stories of mathematics being told as part of a picture, quick instead to identify them as the *wrong* stories of mathematics education and I was nearly distracted by trying to find a way to fix them:

It works for your children?

You're happy that it works?

It feels ok?

YES

This deficit position has become uncomfortable to me. While I accept it is important such issues are made visible and inform debates on mathematics education, I suggest this stance contributes to the construction of limited grand narratives serving to perpetuate negative views of primary mathematics teaching and the prioritisation of quests for *what works* in far flung corners of the globe. I now question the proffered implications of T. Brown and McNamara's (2011) study because once the position of a *right* way versus a *wrong* way is rejected, and one of uncertainty accepted, the *right/wrong* frame for thinking and talking about teacherly practices of mathematics is no longer adequate. I wonder if having had a bad experience of learning mathematics is helpful to acknowledge and voice? Perhaps the understanding of the workings of a mathematics classroom through the lens of general

systems and structures is helpful to some degree? Maybe mathematical teaching strategies are a subset of all teaching strategies? The stories I read in research do not describe what I see and hear when I work with early career teachers, or at least not all of what I see and hear. Chapman (2017c) speaks of similar concerns:

> Some researchers continue to focus on deficiency-oriented studies that tend to focus on what teachers do not know and what should be *fixed* in teacher education or professional development programs. This deficit-based way of understanding and educating mathematics teachers is potentially more damaging than helpful to teachers. It tends to dehumanize the teacher and embody simplistic views of knowledge, the teaching and learning process and their interrelationship. Studies need to transcend the deficit approach and recognise the importance of understanding the teacher's personal knowledge, thinking and experiences regarding mathematics in ways that will provide a meaningful basis of their learning and growth in teaching mathematics. Such studies focus on understanding teachers from their perspectives; for example in terms of their learning, their instructional approaches, and what they know and can do (p.203, original italics).

Mason (2016), too, makes a plea for a different approach. He questions why researchers in the field of mathematics education persist in trying to pin down explanations and predictors of effective teaching practices in the misguided belief they will lead to proficient learning rolled out in neat cycles of cause and effect. Meanwhile any potential for organic development or transformation or the consideration of what is possible 'in-the-moment' or 'on-the-fly' is trampled upon (p.298).

It seems there is space around the grand narrative of fast fixes, for other stories to be told. Perhaps going slow and listening to people who are establishing their practices of teaching

primary mathematics, could contribute to a different knowledge, one complementing projects with similar interests but based on faster principles: fast and slow projects acting in complementarity to support insights into the complexly connected webs, such as those investigated by Davis, Sumara and Luce-Kapler (2008), of becoming a teacher of primary mathematics.

My stories of learning through experience in becoming a researcher perhaps serve to illustrate and juxtapose these different views of change. The slow and unpredictable development of a personal, practical knowledge marked by mistakes and instinctive responses and based more on insight than intelligence has heightened my awareness of processes of change and development, learning. Even as my new practices begin to feel a little more comfortable, more easily employed, I sometimes falter and slip back into old ways of being. No longer a complete beginner but barely more than one, I occupy a no man's land in which I am working to hone my skills and hoping to be recognised as one of the gang as I move slowly along the less novice/more expert scale. It is only when I look back that I can begin to make sense of this learning journey, to notice patterns in my intuitive moves. I think this is the stuff of a narrative view.

Methodological Soup

Clearly then, I did not start this study with all of my ducks lined up. I have had to dwell in the stuff of social research to find my way. Ulmer (2017) explains: 'Slow Ontology, represents a methodological pause – a temporal stasis in which spacetimematterings shift. Slowly' (p.207). Acceptance of the time taken to dwell and the appreciation of slowness as a methodological way of being, have been more unexpected learning curves.

At many points in time I have tried to capture, to commit to words on paper, what my PhD is about. I wrote the following piece a little while ago now and if I were to write it again I think it would be less strident, softer:

> I began my PhD with a conviction that finding out *what works* in mathematics education and applying it to my practice would be a. possible, b. helpful and c. well, what research is all about. As I have come to learn more about the pursuit and shape of knowledge and as I have examined my worldview I find myself railing against the idea of *what works*. I consider it a limited view making futile attempts to impose order on practice with exponential possibility; an idea serving to diminish and constrain the complexity of teaching and learning and the experiences of people as teachers and researchers. I find myself in a place where ideas about finding similarities, themes, and sameness feel insufficient. My work is not about trying to change others nor is it about developing a framework to be imposed on others in order to provoke change. Rather, I aim to illuminate the topic of early career primary mathematics specialism by gaining awareness of the experiences of people living as early career primary mathematics specialists. I see story as integral to such work. The stories only one person can offer to give insight into their world are fundamental to my knowing the world – as a researcher and as a human being. Without their stories I can only make assumptions about the lived experiences of others and the meaning they give to those experiences. Hearing a story ignites awareness and with new awareness I go on to view the world in a different light. I have a belief that to work alongside people means connecting with their perspectives and propose through hearing the stories of others we can begin to see how others see things. (Me, Digital Diary, July 2017)

This draft jars because I am in telling mode and am now aware showing can be a more helpful, sustaining way of communicating. I have learnt to let go a little, to subordinate speaking to listening, certainty to uncertainty, fast to slow. Similarly, the way I think about methodology has shifted. At some point a quest for a list of PhD ingredients I could serve up for wider consumption ceased and without warning, methodology was something I was swimming around in and actively creating through every action and every word. It was no longer a vacuum packed, off-the-shelf product:

Ingredients

Two to three well framed research questions

One philosophical paradigm

One Great Thinker

A methodology

Literature (lots)

One theoretical frame, one data collection tool and one data analysis tool (a standard trio)

To serve

One chapter per ingredient

Top with conclusions

I have come to know methodology as my way of describing what I do when I do research; it is the *how* in researching what I want, how I want. My methodology includes a regular yoga practice and re-listening to interview data while walking the streets and footpaths of Bristol. Conducting research is a more dynamic, living process than I ever imagined. Speedy's (2008) observation, 'I remain at the threshold of that which I do not know' (p.42), captures a sense of the energy and insight the process brings as does Cooper's (2009): 'research is about

generating 'new knowledge' but in my view it is also about enlarging the scope of our self-knowledge in the personal, professional and societal domains' (p.431).

My methodology is soupy and today the recipe goes something like this:

Ingredients

A number of guiding questions

Time

Space

A selection of isms (each brings the flavour out of the other)

A paste of great thinkers

Literature (lots)

Flexible theoretical frames with complementary data collection and analysis processes

To make

Blend ingredients together in the order and proportions fitting to your taste

Stir regularly with insights and intuitions raised during time and space

Narrative inquiry is personal. Etherington (2009) draws on social constructionist, constructivist and feminist epistemology to frame her research. Speedy (2008) describes her work as being shaped by 'postmodern times, poststructuralist ideas and socially constructed worlds' (p.14). These blends of ways of thinking are helpful for supporting an attending methodology, attending by listening, by slowing down. For me, philosophical paradigms cannot live separately and be applied in discrete ways. All are lenses through which it is helpful to see more of the world and I am wholly unable to nail one flag to one mast. I recognise postmodern colours and feminist principles in the philosophical struggles I have had with multiple truths and ways of seeing. I also recognise the view of pragmatism presented by Van Maanen (2011) which favours 'fallibilism and theoretical pluralism' (p.156).

Perhaps there are many ways of trying to say similar things and an unavoidable aspect of the human condition is we are all trying to find our own way, our personal just-right way, of saying them. Turning to the narrative inquirers who inspire me, Speedy (2008) talks of constant noticing and Clandinin and Connelly (2000) of wakefulness. Sedaris (2018), one of my favourite autobiographical writers, describes the habit of staying with moments in which he feels 'truly present' in his everyday writing sessions (p.4). These ways of being are becoming methodological habits of my mind. Crotty (1998) draws on the work of Denzin and Lincoln to explore the notion of 'researcher-as-*bricoleur*' recognising 'an individual's ability to employ a large range of tools and methods, even unconventional ones' in their studies and this description resonates with my developing view too (p.49, original italics).

Strawson's (2004) critique of narrative inquiry has provoked other noticing in my methodological thinking. Drawing on Bruner's arguments, Strawson acknowledges the 'wide-spread agreement that human beings typically see or live or experience their lives as a narrative of some sort, or at least as a collection of stories' (p.428). However, he posits while some people are naturally 'Diachronic' and see themselves and their world in narrative terms, others are 'episodic' with no such tendency (p.430). He suspects Diachronics drawn to conduct research from a narrative position of being tempted to:

> generalise from their own case with that special, fabulously misplaced confidence that people feel when, considering elements of their own experience that are existentially fundamental for them, they take it that they must also be fundamental for everyone else (p.439).

I find Strawson's lens helpful for a number of reasons. It reminds me to be wakeful to my predisposition to make and expect Paula-like stories in which I '*see* cause' (Bruner, 1986, p.17, original italics) and encourages mindfulness of the potential for the insipient imposition of my own grand-ish narratives on others. Also, my stories of my experience as an early

career researcher have an episodic quality to them, as they are not yet sown into place, the narrative threads binding them are not yet able to be stitched. Hovering in the space between looking back on accounts of the past and looking forward to what is yet to come, the lens of the narrative view is refocused from the past to the future. For Bruner (2004) 'we *become*, the autobiographical narratives by which we "tell about" our lives' (p.694, original italics) while for Dewey (1958) 'we keep our "ends-in-view", aims, things viewed after deliberation as worthy of attainment' (p.104).

Over Part One I have drawn on a wide range of data collected over the period of my study. I view the choice and application of methods of data collection and analysis as an integral aspect of my methodology. In presenting and analysing a selection of stories to illustrate my research process, and my learning of it, I have revealed something of methods employed and will now elaborate.

I have used interviews as my main data collection tool alongside associated field notes and documents collated in both digital and physical research diaries. The interviewing phase of my study lasted over a period of three years and three months and a complete list of interviews is provided (see Appendix 1). While I have not drawn on all of the interviews explicitly, implicitly they all feature in this study. As indicated throughout I drew on the work of a number of people to inform my growing narrative interviewing practice (L. Brown, 2014; Riessman, 2012; Seidman, 2013; Speedy, 2008) and am mindful of postmodern ontology and epistemology in my analyses (Elliott, 2009; Fontana, 2003; Gubrium and Holstein, 2009; Holstein and Gubrium, 1995; Kvale, 1983; Kvale, 2006; Kvale and Brinkmann, 2009; Mishler, 1991).

Just as boundaries between literature, ethics and practice and writing have started to dissolve, as explored earlier, the separation of interview/conversation also blurred as I talked

with teachers about their practices and experiences. I notice this blurring becoming heightened in phases of transcription and analysis, influencing the way in which I come to re-present interview data, although, as these phases of my research are on going, I anticipate they will be explored again as my study progresses. For now, I will outline my analytical practices so far.

Listening and re-listening to recordings of interviews, making notes as I listen, walking as I listen, have all become, and are continuing to be, important aspects of my data analysis process. In a developing practice, shaped by Laurinda and Alf (L. Brown and Coles, 2011), I listen to the content to get to the detail of stories told, paying attention to particular story-like moments as with Izzy or following longer threads of narrative development as with Paula. To construct Paula's story I worked back and forth from recordings to notes, notes to recordings, gradually shaping a complete yet condensed version of her account. With Izzy I isolated the 'Oh OK' story and created a more detailed transcript of this moment in time to work with.

Geertz (1993) makes the observation that 'what we call our data are really our own constructions of other people's constructions' (p.9) and Van Maanen (2011) confesses of his writing: 'I've hedged here and there, added an extraneous point or two, polished up some descriptions, and left others out from previous tellings' (p117). Their attitudes and practices give a freedom to the way in which I play with my final choices of re-presentation on the page. As I construct my re-presentations I am aware I try to capture feelings as well as words. I have found narrative researchers turning to poetic forms to communicate their findings (Denzin, 2006; Hall, Towers and Martin, 2018; Speedy, 2016; Staats, 2008; Whitney, 2004) and, inspired by them, I use structures, possibly, considered poetic. Prose alone did not capture what I heard and felt, did not seem adequate.

I have also developed the following conventions when re-presenting interview data. I use neat blocks of fluent text when attempting to capture the content of what was said and communicate it smoothly. My editing process has the intention to support the reading of the text so the direction of the story can be followed. I imagine re-presentations like this being read fluidly and quickly

> When I started teaching in nineteen ninety-one, we used a round robin system with groups of children doing different things and moving from one activity to the next. I became aware that I couldn't get a handle on their learning and felt I wasn't teaching anything so I changed things in my class. I realised I had been going on instinct before

whereas in this version:

> they were teaching everything in a kind of round robin so they had different tables doing science . English . maths or art and that's how I did it . it was a large first school and I just felt … I felt that I wasn't … teaching maths . it felt wrong . I couldn't impart anything new . the children were working through a kind of textbook exercise that was set but it felt that I couldn't get a handle on anything and so

although the text is still offered in a block, repetitions, pauses and uncertainties are indicated, with the number of dots indicating the length of a pause between words. My editing process involves some smoothing but hopefully as you read, you do so a little hesitantly. By distilling information and using space to slow this section down further still, I can be interested in some of the detail supporting Paula in deciding to make a change to her practice:

I wasn't teaching maths

It felt wrong

I couldn't impart anything new

I couldn't get a handle on anything

and notice repeated frustrations and tensions as perhaps being important. When I use an indented format like this it signals I have been highly selective.

At other times I use a more literal format:

Me: So it works for your children sort of thing

Izzy: Yes

Me: So you're happy that it works

Izzy: Yes but it might not for every class I don't know

Me: Yes that's true but for this setting that feels ok

Izzy: Yes

because the back and forth conversational dynamic as well as the content is significant to highlight.

While trying to produce a faithful re-presentation of what was recorded is a consideration, I have come to wear concerns of truth chasing more lightly than I did at the beginning of my study. The sound recorder is an obvious cue to

research interview

not conversation

and plays a large part in influencing *what* is said and *how* it is said (Elliott, 2009), as well as the consent form and the request for an interview and the researcher/researched relationship

there was an old lady who swallowed a fly

but my focus is on the truths people wish to share with me in the given circumstances at that moment in time. Jarvinen (2009) talks of achieving a position between subjective and structuralist approaches rather than either searching for the truth behind stories or trying to make past experiences vanish, and I recognise an aim for a similar point of balance in my practice.

While on the surface it may look as if some of these re-presentations are more true than others, they are all highly manufactured. The form perhaps most likely to slip under your radar is one coming up in Part Two:

> Laura highlights the technical language of mathematics and declares an interest in the way children communicate mathematically. She makes a link between a deep, conceptual understanding and the scope for operating in the world. Holly communicates her awareness of the web of connections mathematics has across the curriculum. She is already thinking about how she might teach mathematical content to make it accessible and interesting to children. Sam has explored the potential power of mathematical apparatus to support children in their learning.

Here the omniscient author speaks over the participants and uses their stories to challenge a view presented in previous research. Text is manicured to such fluidity you could be lulled into forgetting this too is a fabricated version of reality. However, it is also sincere and, hopefully, supports an important thread of inquiry.

These analytical devices support the telling of the stories as they were told to me, my interpretations of them and how I want to communicate them to you. My aims in using them are many: to notice detail and emphasise certain points; to serve the person whose story I am telling; to enjoy the potential narrative research methodology has as a creative act; to be in the story of experience and invite you in too. They also aim to shape the way in which you might engage with them. For Clandinin and Connelly (2000) these are matters of voice, audience and signature and the delicate balance among and between them. Ethical considerations are very much alive as I polish my re-presentations. Having argued the target of an unpindownable truth is not necessarily a helpful aim, I have to question how I might treat the stories of others to ensure I do so in a way that is morally right, if not altogether true. Again, of course, Clandinin and Connelly (2000) have contemplated this; they advocate an approach which makes sure to sustain participants and it is this view I keep in mind as I work.

By way of a summary of this data processing process I will again turn to Freeman (2007). He positions the teller of stories as an autobiographer and describes the creative work of the narrative inquirer as they engage in a:

> series of poetic processes during the course of interpreting these unwieldy data and then writing about them in a way that will not only be informative but, ideally (from my perspective), artful, such that the persons in question can live on the page (p.129).

Having begun to describe my ever developing *how* of data collection and analysis, you, like me, might be wondering what type of narrative analysis this is. Riesmann (2008) identifies three core types of analysis. She defines them as: thematic – where content is the focus, structural – where organisation is the focus, and dialogic/performance – where who, when and why are of interest. I recognise all of these intentions in my ways of working with my

data, however, my main impetus in employing a range of techniques is to explore the *what* of the experiences of the teachers I am talking to as I ask and seek to answer the question: what is your experience of being an early career primary mathematics specialist? The attention I might give to any structural or performance elements are to offer detail of experience, for example, distilling this thread in Paula's narrative:

I wasn't teaching maths

It felt wrong

I couldn't impart anything new

I couldn't get a handle on anything

into what Elliott (2009) might recognise as a minimal structure made up of only the complicating elements, could be recognised as a move to structural analysis but for me, the attention drawn to the structure supports a focus on the content of Paula's experience. I feel a little tentative here because I have come to identify thematic approaches as associated with breaking data up into fragments so they might be coded and labelled and pinned like dead butterflies to a display board. While I appreciate this could be a helpful approach at times, I want to achieve a dynamic analysis, one allowing people to 'live on the page' (Freeman, 2007, p.129).

In Part Two, coming up after a short interlude, I go on to draw on fifteen interviews, five with each of Laura, Holly and Sam, three early career teachers I sustained a connection with over a two-year period, as I hoped I might when designing my research project. I also refer to documents called Expressions of Interest and Transition Training Plans. Prospective postgraduate teachers interested in applying for a place on our mathematics specialist route,

write Expressions of Interest before their PGCE course begins. Our postgraduate teachers then write transition Training Plans at the end of their PGCE year, outlining developmental targets for their newly qualified teaching year ahead.

But, just before bringing Part One to a close, I must introduce one more person and that is, of course, you, the reader. You have been a constant companion in my work and are particularly present in this writing phase as I bring the methodological elements of my study together and seek to communicate them in a suitably messily coherent whole, of which you will be a judge. Speedy (2008) offers a number of criteria for supporting the reading of narrative work and I mentioned one of them, 'aesthetic merit', a little earlier. The other criteria pertain to: 'transparency', 'trustworthiness', 'reflexivity', 'accountability', the extent of the 'substantive and enduring contribution' and the potential for 'impact and transformation' (p.56). While it is too early for you to know the full extent to which I may, or may not, meet these criteria, I hope you can begin to relate them to your reading of my work so far. Overall, I hope to achieve a researcherly integrity recognisable to the field of narrative inquiry and I hope my work honours the stories shared so generously with me.

Learning to attend to my ideas through a collection of stories ringing loudly in my ears, with the support of the ideas and writings of others, in my own time and in my own way, has culminated in me coming to establish some *hows* and in turn try to show them to you. However, there is an undertow of self-doubt as I write. While I know it would not make methodological sense for me to do anything other than offer you the chance to attend to whatever you notice, I still wonder if I have set out my stall well enough. Sometimes I dream I am trying to enter a phone number into a push button keypad and, however hard I try, I press the wrong buttons, again and again. At other times I dream I am driving up a hill so steep only sky is visible through the windscreen, the road lost to sight. The feelings these dreams stir are invoked now as I hover in the space between what is known and what is not yet known. Clandinin and Connelly (2000) observe: 'in most instances, research purposes

that were clear prior to entering the field have shifted and changed, leading the writer to feelings of doubt about the purposes of the research text' (p.138). This is reassuring to a degree: to continue it is necessary to further subordinate certainty to uncertainty.

When all is said and done, my sense is that proponents of narrative inquiry see narrative engagement with human experiences as, well, necessary, because what we have as humans are our experiences and our thoughts about our experiences and an innate desire to share them and notice similarities and differences and this is the stuff of narrative inquiry. My researcherly activity develops through my internal conversations with texts and the external ones I have with people about their practice and their experiences. While I can keep my ends-in-view, as I cannot yet see them clearly, I will call again on M. C. Bateson (1994) for support:

> We will look for the sources of the bits and pieces stitched into improvisations and for the underlying stiffener that unifies; for the habits of learning and ways of building a repertoire from which to improvise, the metaphors that link one experience to another... Increasingly, we will cease to focus on learning as preliminary and see it as threaded through other layers of experience, offering one of life's greatest pleasures... There is a spiritual basis to attention, a humility in waiting upon the emergence of pattern from experience... *Insight*, I believe, refers to that depth of understanding that comes by setting experiences, yours and mine, familiar and exotic, new and old, side by side, learning by letting them speak to one another (p.10-14, original italics).

Interlude

I need to tell you more about some of the people and ideas I have already mentioned before I continue. They are people I have read since starting this study and they have impacted on what I think and how I act. These therapists / biologists / anthropologists / ethnographers / psychologists / enactivists are not the people I expected to read but their ways of thinking, of describing their activities and encounters as people who inquire into the lives of others, have blended with my previous knowledge and understanding of learning and teaching mathematics and offered a world in which to ground my work and a voice for communicating it. They have shaped the way I am learning to listen differently, to be comfortable in uncertainty, to slow down. They have been instrumental in the construction of my *how*. This interlude could perhaps be considered a review although I think of it more as a conversation with texts.

Jane Speedy

You: why do you want to tell me about Jane Speedy's work?

Me: because she's had an impact on how I think about the world and the stories people tell me about their worlds

You: do you need to go back to her? Can't you just tell me how it is for you through your work with Laura, Holly and Sam?

Me: I probably could do that but it would be as if part of the story was missing and the whole point is that research is made up of a whole lot of stuff that I think is important to make more visible rather than reinforce there's a *right* way magically made up by some figure of authority and bestowed upon us so if I didn't make clear the other voices in my work this whole thing wouldn't hang together properly

You: ok so what is it Jane Speedy says and does that has become so integral to your work?

Me: she does stuff like this

You: stuff?

Me: you know, stuff, stuff like this. Stuff that brings to light the thought processes of a person trying to write things down and capture what things are like for people. I think that's helped actually. I think I want to write something down about how Jane Speedy has helped me to think about what it might look like to be reflexive and why that's important in a study like this. (Me, Digital Diary, October 2018)

As you know, I have already drawn on Jane Speedy's thinking a great deal, however, I was reluctant to engage in her work initially. When Laurinda offered me *Narrative Inquiry and Psychotherapy* (Speedy, 2008) the word psychotherapy put me off and apart from an occasional dip the book stayed on my shelf for a good while. I felt reading it would take me in two misleading directions. First, I would be poking about in a category of research

irrelevant to my field and second, I would be playing with a realm of knowledge not viewed as important by academia: not only would I be trying to focus with the wrong lens I would be damaging my career as a researcher before it even started. Stengers (2018) notes, in the fast science race, researchers

> affected by the beings with whom they were dealing, looking for suitable relationships with them, putting the adventure of shared relevance above the authority of judgement (p.42)

were not often recognised as real researchers.

As the rejection of master narratives became an infinitely more attractive prospect than the obvious alternative and words and phrases like 'liminalities' and 'reciprocal and relational space' became interesting as well as odd I took a longer dip and now Jane Speedy's work has become essential for me in coming to be with the stories of others while I hear them and then while I think with them later. 'Firmly held commitments towards uncertainty and messiness may well be misread as a lack of 'authority'' she says (Speedy, 2008, p.42). In adopting a position embracing learning from experience, I am reconciled with a shape-shifting reality however others may view this position.

Borrowing shamelessly and on many levels from Jane Speedy (2016) she also says things like:

> It is not the story of a lone inquirer, but rather, of a woman sustained by many conversations (Speedy, 2008, p.x).

> The co-researchers in this study, the people who have generously contributed stories from their lives, would be regarded as co-authors in another time-space dimension (Speedy, 2008, p.x).

> "You don't need to know everything. There is no everything. The stories themselves make the meaning. The continuous narrative of existence is a lie. There is no continuous narrative, there are lit up moments and the rest is dark" (Winterson, 2004, cited in Speedy, 2008, p.xiii).

and her words and the words of others she has chosen to repeat become part of my vocabulary of being because they capture something bubbling under the surface and say it in a way that connects with me. Her thinking is not just told but lived and for me this makes her work powerful and relevant and respectful. Her writing has a conscious integrity and it supports me in being able to research what I want, how I want. For example, I have struggled with knowing which beginning to place at the start of this study because everything in here is a beginning of some sort but the structure of a dissertation, or my current understanding of a dissertation anyway, does not allow all of the fragments to hang alongside each other as in Cornelia Parker's *Cold Dark Matter* (1991). It was a relief to find ways of being with many beginnings in Jane Speedy's works

> Not to mention the myriad versions becoming apparent to you, the readers, as you re-tell these stories to yourselves within the conversational space that is opening up between us (Speedy, 2008, p.xiii)

along with

> the notion that human identity is a social achievement, contingent on time, context, audience, culture, history, memory and personal agency and that the stories we tell ourselves and each other in our day-to-day exchanges both constitute and are constitutive of our lives (Speedy, 2008, p.xiv).

I find these awarenesses at once liberating and reassuring: I am in the place I need to be to talk about the stories of the people I am listening to because the tensions I am experiencing as I think and read and write and listen are fundamental to narrative research. That Jane Speedy's narrative work is located in a therapeutic context is no longer a constraint for me: the conversation I have with her text-bound stories as they strain at the seams and take flight from the page is around being with the stories of others differently, ways not constrained by rules, judgement or ill-conceived notions of authority but ways that might support a change in how early careers teachers with their dedication and commitment and interests can be viewed. And I am only in the preface.

Jane Speedy (2008) explores the crossing point at which 'the narrative turn meets the postmodern condition of uncertainties and incredulities towards universal truths' (p.11). Some commitments to universal truths I have come across in my study so far seem to be perpetuated by dichotomies:

Right/Wrong

Certainty/Uncertainty

Interview/Conversation

Novice/Expert

Diachronic/Episodic

Provoked by Jane Speedy's (2008) troubling of borders I am becoming curious about the space between these positions, the space denoted by the /, and in the way in which aspects of each position reside in the other. Hesitating to consider what lies in the space between and how extremes connect, offers me an alternative view of the world.

An underlying tone in some narrative work I have read is one of hat-doffing apology: it seems researchers choosing to take a narrative approach sometimes want to find a way of

making their work more scientific, perhaps in response to the opinions noted by Stengers (2018), as if that might make it more acceptable somehow. Jane Speedy has helped me to resist this urge to – comply? and see a greater potential in narrative inquiry by it being confidently and coherently unsure. She has helped me to think about soupy methodologies, to navigate the blurred lines between philosophical paradigms and put my developing ways and *hows* under the microscope (Reed and Speedy, 2011). To not do these things would undermine any claim to any inkling of awareness my work might offer, would not contribute to opening up the world of research to different possibilities and insights. I cannot imagine Jane Speedy ever apologising for herself.

Mary Catherine Bateson

Reading whole academic books was something I did not see myself doing. Journal articles - yes. Chapters of books – yes. Whole books – no. Whole books were reserved for the luxury of leisure time. Study/leisure-leisure/study: this is another boundary my PhD has blurred. *Peripheral Visions: learning along the way* by Mary Catherine Bateson (1994) was, I think, the first whole book, in direct relation to this study, I read and I have come to see being with the ideas of one person by committing to a complete text both a methodological ingredient of narrative inquiry and a pastime. I found Mary Catherine Bateson's book in Clandinin and Connelly (2000) and, although unsure about the narrative anthropologist bit, felt compelled to read her work:

> The narrative anthropologist also offers an "I", the "I" that grows out of the ambiguous, shifting participant observation relationships, the "I" who learns by seeing and telling stories along the way, and who writes the stories of relationship (p.9).

I have always underlined, boxed and made notes on academic texts as I read, an instinctive response to something that resonates, the flash of a new thought, something I do not understand or that jars. My copy of *Peripheral Visions* is scrawled over and looks a little like this:

> We are called to join in a dance whose steps must be learned along the way, so it is important to attend and respond. Even in uncertainty, we are responsible for our steps.
>
> (p.10)

the variety of possible responses – in interviews

> Many tales have more than one meaning. It is important not to reduce understanding to some narrow focus, sacrificing multiplicity to what might be called the rhetoric of merely (p.11)

the future is present in the present

> Yet the revolution that occurred seven years later was present in that garden, present in the class differences and the ambivalent relationship to tradition of the wealthy urban landowners, the cultural disparities between them and the villagers they were employing, the suspect presence of a foreigner (p.13)

And two hundred and forty three pages later Mary Catherine Bateson's ways of seeing the world, of attending to it and telling it, have become part of my way.

As well as these wonderful snippets communicating a sensitive sustenance of human experiences, the stories around them Mary Catherine Bateson tells also stay with me. My favourite is the one about acknowledging and respecting the range of reactions to a burning building and

> the itch to take action (and the perception of inaction as inferior). (p.158)

you must read it.

To look whole for a moment, I think Mary Catherine Bateson's book is about learning and about learning as change. It is about seeing sameness and difference and challenging the human condition to favour sameness over difference because difference is so often perceived as equalling threat. An element of my learning, along the way of reading her book, has been to do with a change in the way I think about learning from experience. Previously I had associated this idea with a sort of retrospective or 'done to' stance: I experience something, I look back on that experience and I am changed as a result. What I had not thought about so deeply was what I bring in the first place and how much I shape the experience I will have. For Mary Catherine Bateson learning from experience is not a passive endeavour: she highlights our entering of any new situation with experience behind us. We bring a view, a set of culturally situated tools and we act with agency as we improvise our way through our lives.

> I was trying to understand how the community and the city beyond were seen by the villagers.
>
> (p.16)

the worth of the question? the development of the confidence that 'yes' this has worth

> I used the sequence of experiences I had had with cultural attitudes towards death to illustrate the fact that complementary themes are found in every culture
>
> (p.24)

what will I use a sequence of experiences to Illustrate?

A particular theme I am perhaps preconditioned to be alert to is that of her views on schools as places of learning:

> Wealth and power are obstacles to learning. People who don't wear shoes learn the languages of people who do, not vice versa (p.69).

> Taking on a new role or entering a new institution are both transitions when the self is put at risk: school systems are often particularly violent in their attack (p.66).

> These are very expensive agreements to give. Traditionally the definition of oneself as ignorant has been compensated by the promise that, at the end of some number of years of submission and deference, one will be allowed to become somebody – a pillar of adult society (p.67).

> It is almost as if schools demanded, Leave your self, your self-esteem, the confidence accrued from learning to walk and speak, at the door. And do that without genuine confidence that in the end you will have share in your society and that being an adult is desirable. This is what many children are asked to do in school. I can't think why anyone puts up with it (p.67).

> One way to survive is to learn, accepting the internal change that new learning requires and the loss of status that goes with being a beginner again (p.71).

While seen from the perspective of a child on the landscape I am left with a sense of foreboding for Laura, Holly and Sam. I wonder what postgraduate teachers learn at school.

Gregory Bateson

Gregory Bateson's work has also been influential on my developing capacity to blur boundaries and see fuzzy in order to see, in time, with greater clarity. One chapter in particular has come back and back and back to me: *Culture Contact and Schismogenesis* in *Steps to an Ecology of Mind* (G. Bateson, 2000):

> It seems to me this chapter is a tongue in cheek, to put it mildly, suggestion of how things could be organised in order to categorise events, situations, and how ridiculous it is to attempt to think along those lines let alone try and come up with something meaningful and useful. It reminds me of bacteria multiplying. As soon as you have named and categorised one thing, something else will come along and this something else could even be a different interpretation of the initial thing. I think he is ridiculing such ideas. Have I created constructs that will not withstand interrogation? Constructs I am taking too seriously? (Me, Reading Journal, January 2017)

I suspect a cumulative effect at play, as I am sure reading one chapter alone would not cause such a shift, but my conversations with Gregory Bateson's work have helped me to wear lightly some of the constructions I was building my inquiry with at first. As I re-listen to the interviews I made over the course of this study, I notice a gradual reduction in naming and labelling as I begin to feel less comfortable with quick answers and seek more expansive ones. The term "primary mathematics specialist" begins to feel like an imposition and gives way to "people with an interest in primary mathematics". The idea I could say "tell me about your subject knowledge in mathematics" and then offer something helpful back to the wider world about the response given, started to feel ridiculous, like building a house of cards and then nailing jelly to its walls. Speedy's (2008) 'reciprocal and relational' (p.58) spaces resonate here: my attachment to terms embedded in my world of learning and teaching mathematics fenced the potential of my communications with Laura, Holly and Sam. I felt as if I was making them say things to please me, as if I was forcing them to play a game of "guess

what's in the teacher's head" rather than creating a helpful dialogic space allowing for a sharing of ideas that might, in turn, support a constructive view of the lived experiences of such teachers. My naming and labelling was getting in the way.

In *Mind and Nature: a necessary unity* Gregory Bateson (1985) argues we have a tendency to be taught to define things as separate entities rather than by their relation to other things. For him, when thinking of connections, his attention is with 'the *pattern which connects'* or, as he defines it, the *'metapattern*... a pattern of patterns' (p.20, original italics). To exemplify his thinking about patterns of patterns Gregory Bateson offers a collection of 'basic communicational characteristics' (p.34). His ideas connect with some of the slowly forming questions about knowledge and reality I find myself facing.

Perhaps building on his earlier observations about naming and labelling Gregory Bateson explores what we are drawn to notice. He suggests we notice big changes and what comes in large quantity but argues that quantity does not determine pattern:

> What appears to be a genesis of pattern by quantity arises where the pattern was latent before the quantity had impact on the system. The familiar case is that of tension which will break a chain at the weakest link. Under change of a quantity, tension, a latent difference is made manifest (p.64).

For Gregory Bateson this analogy provokes a questioning of the narrative structures we humans invoke to explain, to order, to make sense of. For him, this method of sense making is flawed:

> There is a strong tendency in explanatory prose to invoke quantities of tension, energy and whatnot to explain the genesis of pattern. I believe that all such explanations are inappropriate or wrong. From the point of view of any

> agent who imposes a quantitative change, any pattern which may occur will be unpredictable or divergent (p.64).

This line of thinking challenges the philosophical notion of teleology in which we might be drawn to explain our actions by results. But:

> Causality does not work backwards… Lineal thinking will always generate either the teleological fallacy (the end determines process) or the myth of some supernatural controlling agency (pp.71-72).

Gregory Bateson bases his conclusions on logic and reasoning. For me, they sound a postmodern call and remind me of Bruner's (1986), Freeman's (1998) and Strawson's (2004) earlier mentioned views. Logic and reasoning versus a postmodern positioning? Perhaps such distinctions have no matter. What does matter, according to Gregory Bateson, is I may be on the verge of making some fundamental errors in coming to know more about what may or may not lead to, or provoke, or support, change and development in both my practices and those of the people with an interest in mathematics I work with. I notice how easy it is to be lulled into forgetting the subjective nature of experience and into making conclusions and decisions based on an unquestioned belief that we can, and will, see what others see. Gregory Bateson organises his observations in a chapter called *Every Schoolboy Knows* and the irony of the title stings a little. I seem to have posed unanswerable research questions and then gone about trying to answer them with broken logic. However, two further ideas perhaps offer the potential for movement forward:

> the shape of what happened between me and you yesterday carries over to shape how we respond to each other today. And that shaping is, in principle, a *transference* from past learning (p.24, original italics).

> The recipient must be, in some sense, ready for the appropriate discovery when it comes (p.56).

Amia Lieblich, Elliot Mishler and Don Polkinghorne

In the *Handbook of Narrative Inquiry,* Chapter 24: *Looking Ahead,* by Clandinin and Murphy (2007) is built around conversations with Amia Lieblich, Elliot Mishler and Don Polkinghorne. I cannot claim to have read their work widely but their thoughts about the potential and problems of narrative inquiry have lingered and shaped the active choices I have made in this learning/research process so it feels appropriate and necessary to mention them here. In essence this chapter is largely about current philosophical and practical debates surrounding narrative inquiry. While Speedy and M. C. Bateson support me in coming to new awarenesses about the activity of researchers by living out their ontology, epistemology and practice on the page, Clandinin and Murphy invite Polkinghorne, Mishler and Lieblich to talk about their views on working in a narrative arena. Their discussions remind me I came to social research hypnotised by the lure of the	28.11.18 I have woken up today thinking about the words 'agency' and 'novice'. The new girl on the block: a narrative study about novices and agency or the agency of novices? I recall Malcolm Reed in the philosophy and research design module saying something about you have to look and look and keep niggling away at your work to make it happen. You do think it into existence and that's weird. And then you write it into existence. A lot of experience is cerebral and my head is hurting today. To think you have it all worked out ready to unroll is the biggest lie in social research. I feel as if I've been hoodwinked. At my last supervision I was in some angst about what method of analysis I was using and Laurinda said something like 'it's narrative because this is narrative writing'. I think this is similar to Polkinghorne's view.

generalisable and the holy grail of statistical significance; the quest for sameness so culturally engrained I did not yet have another way to be able to experience academic research. Polkinghorne explains he encourages noticing of difference in order to capture the 'unique histories of people' (Clandinin and Murphy 2007, p.633). He takes the view that narrative inquiry is not the same as taking narrative data and analysing it qualitatively. His descriptions create a flow diagram in my mind, a sort of progression from positivist research to qualitative research with a positivist mind-set to narrative research with a qualitative mind-set embedded in a positivist mind-set. [There was an old lady who swallowed a fly I don't know why she swallowed a fly perhaps she'll die].	27.11.18 So I am re-visiting PVs in order to write the MCB section in Interlude. I am also transcribing Holly's third interview – NQT year in the Christmas holidays. It's really awful! Much in MCB resonates with what she was going through. I wonder if this is also what was going on in Laura's third interview – the 'not' interview but they had completely different ways of dealing with the circumstances? Anyway, the best I can do right now is capture some of the quotes from MCB that resonate – see 'A Mutable Self'. My ponderings on my walk back from Morrison's after two days of grappling with Interlude and JS and GB and MCB and DP and EM and AL: it's something to do with the philosophy again. EM's concern regarding what we select (the same as JB's and the headset and the same as CW's in my last 'thinking aloud' session) it kind of assumes that in some way other types of research (and I suppose by this I mean more quantitative based stuff because this is a qualitative thing (not just a NI thing I think? But perhaps 'worse' in NI?) is if you actually believe a more scientific approach is not just as selective, not just as prone to the occasional omission the odd elaboration – as

Perhaps such a flow leads to the slightly apologetic position of academic researchers who find themselves so far away from doing the research they have been conditioned to value most highly they wonder if they are actually doing research anymore and so seek ways to justify their work. It reminds me of working with PGCE teachers and encouraging them to take a critical, questioning stance but only within the parameters we have decided it is acceptable for them to do so. > And the difference was the narrative analysis which was looking at an individual life or portion of the life and the final result was a story…. It came from a lot of different sources, but what you tried to end up with was a description of the life movement of a particular person (Polkinghorne in Clandinin and Murphy (2007, p.634). [That makes so much more sense now.]	if numbers and people behind the numbers don't lie? As if some types of research are immune to this? IT'S ALL BEING MADE UP BY PEOPLE. I would not have been able to write this study if I was an experienced researcher. I'd have it all neatly wrapped in a Paula-esque story. Maybe we have most to learn from novices [well I would say that but you get my point]. I have had to make my how present – so that I could know it. I can't step into the same stream twice – another favourite from MCB + the 'it's all been done before' thing. More 'scientific' papers give the most tidy narratives of all so following EM's logic they should be the least believable as they are not messy, not complex, not layered – I am not sure what they can possibly be true to. Back in ontology and epistemology land. Pragmatism? It doesn't matter if 95% of people respond well to this cancer treatment if I'm one of the 5%. 5 out of 4 people don't understand jokes about fractions. Novices are stepping into the stream for the first time. They are going through the process. They are slowing down time because they do not have the fluency of

Mishler raises problems of narrative researchers making selections about what aspects of their huge data sets they will re-present and this too has been a stumbling block for me. The life movement inherent in my narrative is helping with this particular issue in this particular study but would probably not be feasible in a journal article. The looming decisions I will need to make shortly about Laura, Holly and Sam's interview data tug at the strings of my neocortex as I read Mishler's concerns [although that is a bit of a lie because I have already written 'Laura' and I have transcribed all of my interviews with Sam and nearly all of those with Holly and already I know I am going to tell you about Holly's angles, Sam's fish and Ella Fitzgerald]. That's my reservation about people who simply give you a fragment of text and then interpret it without analysing the text. I find it difficult to think in terms of validating what they're doing… I find it problematic. But it's in the sense that we were always presenting our material so that a reader, other researchers,	experts yet. The back and forth I have tried to capture is a genuine part of the process. I have not replicated the actual order of the back and forth as that would have been impossible (and unnecessary and painful) but I have tried to show it because this a) illustrates the nature of a novice constructing a practice (or this novice anyway) b) is the only way I can talk about my work right now c) is kind of fun. I can imagine you are having trouble with a consistent use of tense but I hope that adds rather than detracts. I hope you get a bit lost sometimes and think things like 'hasn't she already said that twice'. That I'm giving you deja vu. I am making all of these choices. None of it is happening by accident. Right now I'm in the Speedy / Winterson camp. I suppose what is helpful to ask is – but is it research? (Me, Digital Diary, November 2018)

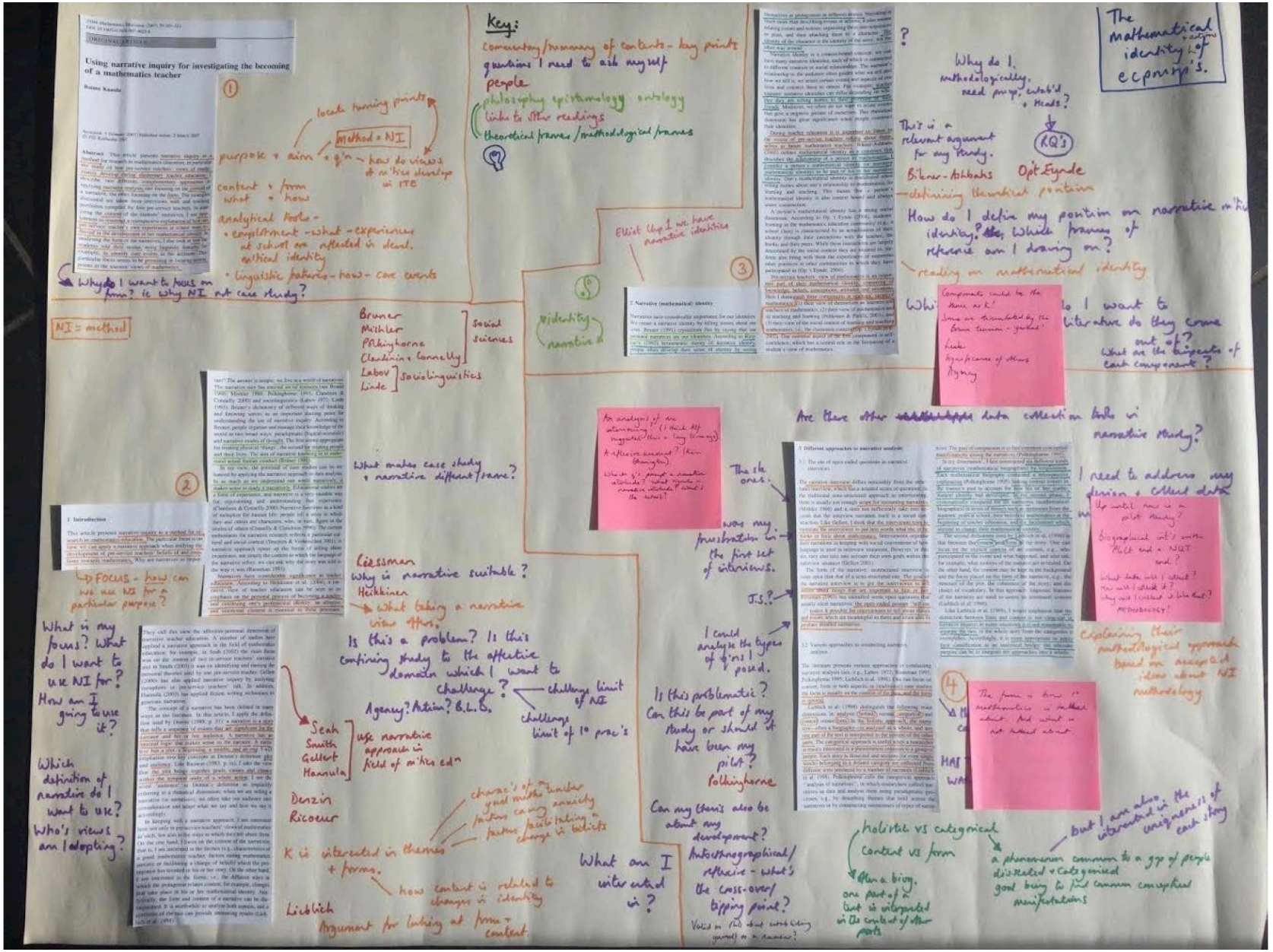
can make her or his own judgements about whether the interpretation makes sense, whether the analysis brings up something that's of interest (Mishler in Clandinin and Murphy (2007, p.636). *does the analysis bring up something that's of interest?* Lieblich deals with the 'is it research?' question: a 'humanistic holistic view of human beings… was not considered research, it was case studies maybe and stories, but not research' (Lieblich in Clandinin and Murphy (2007, p.637). She tussles with the tension between working from a post-modern perspective in an academic arena that cannot break lose from its traditional moorings and weighs up the advantages of methodologies incorporating approaches and techniques spanning the philosophical divide. She concludes, ultimately you have to 'make your choice' (Lieblich in Clandinin and Murphy, 2007, p.639).	

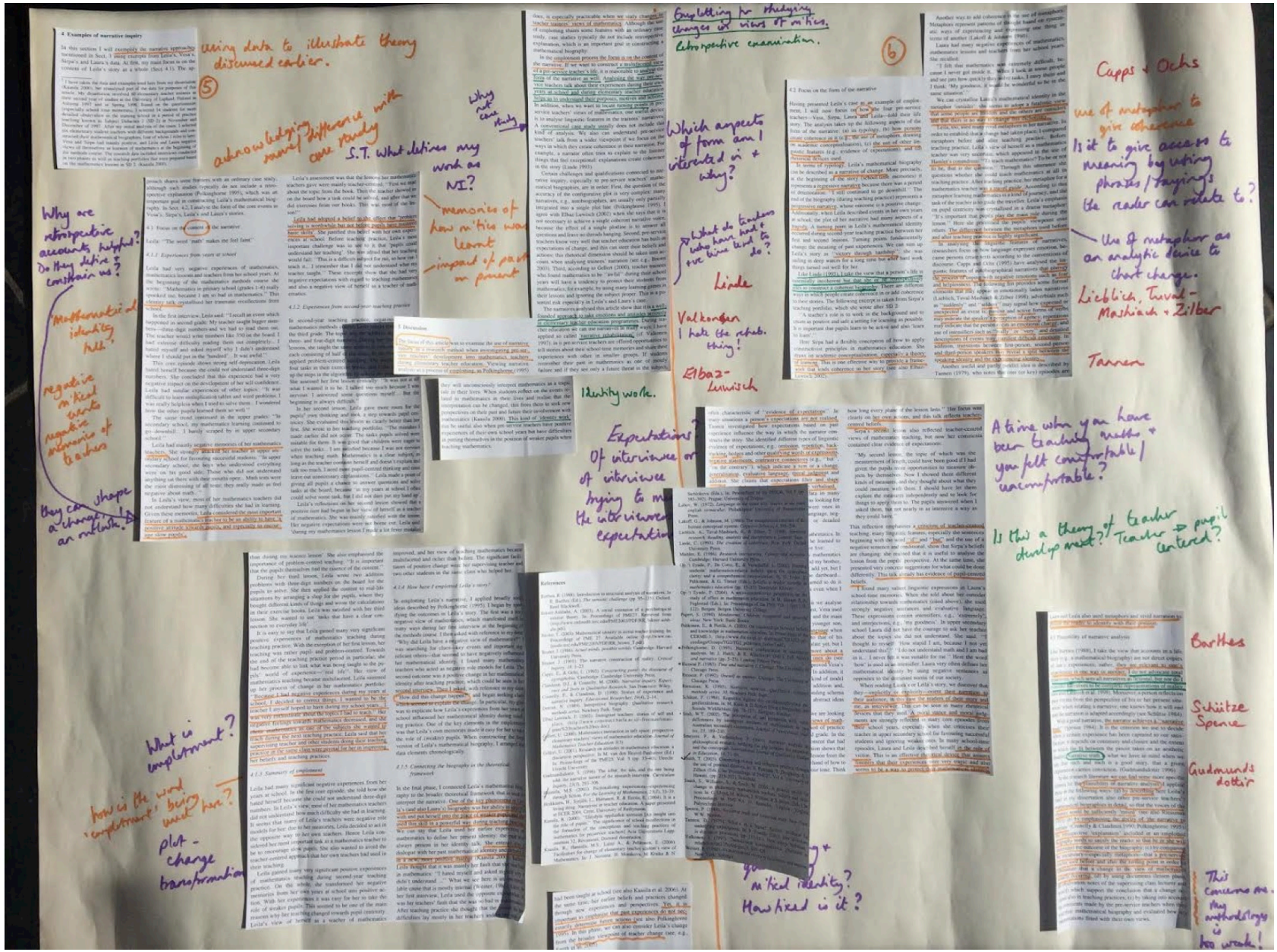
Raimo Kaasila

As mentioned earlier, I have always annotated academic texts. I took this practice further than usual when working with Raimo Kaasila's (2007b) journal article *Using narrative inquiry for investigating the becoming of a mathematics teacher*. I was excited to find a researcher using narrative inquiry in the field of teacher education with teachers of mathematics and went through a process of deconstructing his paper (see images on the next two pages) in order to unpick and recognise the different facets of knowledge and practice a researcher brings to bear on a topic. I remember saying to Laurinda and Alf: "this is the kind of work I want to do – and it's been published in ZDM!". Raimo Kaasila's papers, and those he writes with others, have a methodological leaning; these researchers are interested in applying a range of methods associated with narrative inquiry to gain insight into the mathematical identity of pre-service teachers. Identity is viewed as important due the influence it can have on the decisions teachers make, the connections they make with students and their 'willingness to develop professionally' (Lutovac and Kaasila, 2018a, p.253). Mathematical identity is seen as one aspect of a person's narrative identity, 'a construct that describes the relationship of a person to mathematics' (Kaasila, 2007b):

> One's mathematical identity is manifested when telling stories about one's relationship to mathematics, it's learning and teaching. This means that a person's mathematical identity is also context bound and always under construction (p.206).

Raimo Kaasila's work is located in the 'long Finnish research tradition of studying the beliefs, views towards mathematics and mathematical identities of pre-service teachers' (Lutovac and Kaasila, 2014, p.130). There is a pattern to the design of the research projects. It typically involves starting with questionnaires given to large numbers of pre-service teachers. From this initial round of data collection selections are made based on a judgement as to which


Key:
commentary/summary of contents - key points
questions I need to ask myself
people
philosophy epistemology ontology
links to other readings
theoretical frames / methodological frames
Using narrative inquiry for investigating the becoming of a mathematics teacher
Raimo Kaasila
purpose + aim
Method = NI
locate turning points
how do views of m'tics develop in ITE
content + form
what + how
analytical tools -
• emplotment - what experiences ad school are reflected in decal. critical identity
• linguistic features - how - core events
Why do I want to focus on form? is why NI not case study?
NI = method
Bruner
Mishler
Polkinghorne
Clandinin + Connelly
Labov
Linde
social sciences
sociolinguistics
identity
narrative
Elliot Ch 1 we have narrative identities
Why do I, methodologically, need prop, what'd + Heads?
KQ's
This is a relevant argument for my study.
Bibler-Ashbahs
Opt Eynde
defining theoretical position
How do I define my position on narrative m'tic identity? Which frames of reference am I drawing on?
reading on mathematical identity
The mathematical identity of ecpnnp's.
Components could be the three as k'
Ideas are stimulated by the Brown tension - guided'
Link
Significance of Others
Agency
What do I want to literature do they come out of?
What are the subparts of each component?
Are there other data collection tools in narrative study?
I need to address my fusion + edited data
Up until now is a pilot study?
Biographical int's with NQT and + NQT and ?
What data with I collect? How will I collect it? Why will I collect it this way? I collect in this way?
METHODOLOGY!
Explaining their methodological approach based on accepted ideas about NI methodology
Clessman
Why is narrative suitable?
Heikkinen
What taking a narrative view does.
Is this a problem? Is this confining study to the affective domain which I want to challenge?
challenge limit of NI
challenge limit of 1° proc's
Agency? Action? B.L.D.
Is this problematic? Can this be part of my study or should it have been my pilot?
Polkinghorne
Can my thesis also be about my development?
Autoethnographical/ reflexive - what's the cross-over/ tipping point?
Valid in that what we're doing yourself as a researcher?
What am I interested in?
Seah
Smith
Gellert
Hannula
use narrative approach in field of m'tics edn
Denzin
Ricoeur
changes of great misbe + wider factors causing anxiety factors facilitating change in beliefs
K is interested in themes + forms.
how content is related to changes in identity
Liblich
Argument for linking at form + content
Holistic vs categorical
Content vs form
Often a biog. one part of a text is interpreted in the context of other parts
but I was also interested in the uniqueness of each story
a phenomenon common to a grp of people
dichotomised + categorised
good way to find common conceptual manifestations
Ch 4 Different approaches to narrative analysis
3.1 The use of open ended questions in narrative interviews
3.2 Various approaches to conducting narrative analysis
4.1 Introduction
FOCUS - how can we use NI for a particular purpose?
What is my focus? What do I want to use NI for? How am I going to use it?
Which definition of narrative do I want to use?
Who's views am I adopting?


using data to illustrate theory discussed earlier.
5
acknowledging researcher difference with case study
Why not case study
S.T. What defines my work as NI?
memories of how nities was learnt
impact of past on present
Storytelling for studying changes or views of nities.
Retrospective examination.
6
Which aspects of form am I interested in + why?
What do teachers value/ how hard + give time tend to do?
Linde
Valkenburg
I hate the rehab. thing!
Elbaz-Luwisch
Capps + Ochs
use of metaphor to give coherence
Is it to give access to meaning by using phrases / sayings the reader can relate to?
Use of metaphor as an analytic device to chart change.
Lieblich, Tuval-Mashiach + Zilber
Tannen
Why are retrospective accounts helpful? Do they define? constrain us?
Mathematical identity, NI?
negative critical events negative memories of teachers
they can shape a change! an outcome!
Identity work.
Expectations
Of interviewee or of interviewee
trying to meet the interviewers expectation
A time when you have been teaching maths + you felt comfortable/ uncomfortable?
Is this a theory that develops next?
Teacher → pupil centered?
Barthes
Schütze
Spence
Gudmunds dottir
What is completement?
how is the word 'completment' being used here?
plot - change transformation
positive critical events
negative critical identity?
How fixed is it?
This concerns me. My methodology is too weak!

people will make the most significant contributions towards further understanding of the topics under investigation and over time we meet Vesa, Sirpa, Ella, Inka, Aila, Erja, Ari, Reija, Heli, Pia, Barbara, Ana and Ines (Kaasila, 2007b, p.206; Kaasila, 2007a; Kaasila, Hannula, and Laine, 2012; Lutovac and Kaasila, 2014; Lutovac and Kaasila, 2018a; Lutovac and Kaasila, 2018b). Bruner's stance that our personal narratives are our identities is embedded in Kaasila's works (Kaasila, 2007a; Kaasila, 2007b) and Denzin's definition of the concept of narrative is used as a frame:

> a narrative is a story that tells a sequence of events that are significant for the narrator and for his or her audience. A narrative has an internal logic that makes sense to the narrator. A narrative has a plot, a beginning, a middle, and an end (Kaasila, 2007b, p.206).

Other theoretical views adopted recognise we construct autobiographical tellings of our lives as if they were lived coherently and that while such recounted events are not direct copies of experience, they are relevant to experiences in one-way or another (Kaasila, 2007a).

Raimo Kaasila and his co-researchers conduct unstructured narrative interviews. Their goal is to get people to tell stories about things of importance to them in detail. The researchers are interested in both the content of teacher's discussions and in the form of their talk but do not seek to make distinctions between the two, instead working to integrate a range of analytic approaches 'into a whole' (Kaasila, 2007b, p.206). They aim to 'explicate how a person's earlier experiences have influenced his or her past and present mathematical identity' (Kaasila, 2007a, p.374). To do so a range of holistic and categorical approaches and analytic techniques are applied: complete biographies are constructed, commonalities across texts are found, categories are created, stories are dissected, sections and words sorted. Discourse analysis techniques are applied: turning points are searched for, key episodes are identified, 'interpretive repertories' are given names such as 'Victim' and 'Gaining an insight'

(Kaasila, 2007a, p.374; Kaasila, Hannula, and Laine, 2012, p.982). Plot lines are highlighted and used to demonstrate how a person's mathematical identity might change over time or how individuals describe their experiences. Snippets from interviews with pre-service teachers are offered to exemplify repertoires and are strung together with analytic commentary making links to theoretical frameworks and creating new ones.

The research teams propose it is important to 'understand purposes, motives and actions' observing that teachers who had bad experiences themselves can seek to protect their children from mathematics and use lots of games in lessons in order to ignore 'the subject proper' (Kaasila, 2007b, p.212). They notice identity talk tending to be more negative amongst pre-service teachers at the beginning of their teacher education courses concluding: 'if they recall failure and see the subject as threatening they interpret mathematics as a 'tragic tale in their lives' (Kaasila, 2007b, p.213). Opportunities for pre-service teachers to talk about their negative experiences with mathematics individually and in small groups and giving 'pre-service teachers tools to deal with recollections and experiences' are seen to lead pre-service teachers to reflect on events and 'discover that the interpretations of events can be changed' so freeing them 'to search for new perspectives on their mathematical past and future' (Kaasila et al., 2012, p.991). 'Discourse communities' are noted as being an important factor in the process of change (Kaasila, 2007a, p.383). The researchers see themselves as seeking to facilitate teacher-identity development through such 'identity work' (Lutovac and Kaasila, 2018a, p.254). Other awarenesses include researchers noticing that 'identity claims are bound up with justification of conduct and beliefs' and that 'people construct their identity in relationship to others' (Kaasila, Hannula, and Laine, 2012, pp.978-979).

I look back and wonder why I was drawn so strongly to Raimo Kaasila's work. As well as the relevant context of mathematics education and some of the same ancestral influences Bruner, Denzin, Clandinin and Connelly, Mishler, Polkinghorne, Reissman, Chapman, there is

something self-assured about it. I felt as if I had discovered the blueprint for working from a narrative position with early career teachers in exploring their mathematical lives and this exerted a powerful force. I dissected and labelled his paper and set about establishing my versions of his ingredients and then I got lost along the way. Gladly lost. From today's vantage point I re-read the corpus of work and take issue with the dissection and naming and labelling, becoming uncomfortable as I sense bacteria multiplying. Frameworks feel imposed upon teachers and their negative experiences of mathematics. I am interested in what Raimo Kaasila says and does. I recognise some of the plot lines in the stories told by Laura, Holly and Sam and think the findings of the studies offer important awarenesses for people learning to be mathematics teachers and mathematics teacher educators but his how is not my *how*.

As all good researchers do, Raimo Kaasila discusses irks and itches of his work. The complexity of the data is recognised with the practice of isolating single plot lines which appear to 'answer all questions and leave no threads hanging' noted as a tension (Kaasila, 2007b, p.212). The devised repertoire names are acknowledged as being open to interpretation and it is accepted similar repertoires might be named differently in different studies by different researchers. Raimo Kaasila notes what is perceived as expected of interviewees can impact on the stories they share and that it was difficult for the pre-service teachers to, in some way, pinpoint the most significant factors in a process of change (Kaasila, 2007a, p.383). The work is declared as 'interpretive… reflexive, theoretical and contextual' (Kaasila et al., 2012, p.992) but I am not sure it is embraced for being so, more, justified? Similarly the fact a limited number of cases are worked with is noted with a claim for 'logical generalisations' to be possible (Lutovac and Kaasila, 2014, p.133). I wonder if I detect a tone of apology. Is there a concern on the part of the researchers that despite the careful dissections the work is just not scientific enough? Not valid, not generalisable, not adequate?

I am interested to notice a gentle change in Raimo Kaasila's work over time. It seems there is a move from striving for the traditionally scientific to 'a more balanced psychosocial theoretical perspective, one that gives equal consideration to both individual and social domains' (Lutovac and Kaasila, 2018b, p.770). Arguments for a 'more holistic picture of teacher identity' and calls for 'more explicit descriptions of the contexts in which studies are conducted' made (Lutovac and Kaasila, 2018b, p.774). I am also interested to observe Raimo Kaasila's work moving from a more backward-looking stance to a more forward-looking one over the eleven years in which the selection of papers I have referred to were published. Over time, Raimo Kaaslia develops an interest in analysing how pre-service teachers 'anticipate their possible future identities' acknowledging this may be more helpful for informing teacher education courses than a retrospective view (Lutovac and Kaasila, 2014, p.130). As in previous work, repertoires are theorised with two types identified and characterised: 'decisive' and 'irresolute' with agency being described as a feature of a decisive stance (Lutovac and Kaasila, 2014, p.139). A turn to therapeutic narrative tools and the promotion of 'anticipatory reflection' in teacher education courses is recommended (Lutovac and Kaasila, 2014, p.141):

> It is a process of deep reflection and self-evaluation where past, present and future mathematical identities enter into a dialog that leads to one's awareness of a tension or gap between the actual and the ideal state of mathematical identity… future views about oneself can be very motivating (Lutovac and Kaasila, 2014, pp.131-132).

The significance of 'pre-service teacher education communities' in having a positive impact on the positive identity development of teachers is a theme which persists across the work (Lutovac and Kaasila, 2018b, p.764). In one of Raimo Kaasila's recent studies he worked with Vesa again, over twenty years after first doing so. The work led to the recognition:

> that teacher identity cannot be reduced to a teacher's content and pedagogic knowledge alone; instead it involves intersections of a teacher's work, re-told in narrative. This narrative framework is also a reminder of points of continuity and change (Lutovac and Kaasila, 2018a, p.263).

There was also an indication that 'experiencing crises during one's teacher education can assist one in developing a strong teacher identity' but that it was important 'that crises not be initiated in high-stakes settings' with teachers not "punished" for being unable to 'demonstrate various ways of teaching mathematics' (Lutovac and Kaasila, 2018a, p.263-264, original quotation marks).

D. Jean Clandinin and F. Michael Connelly

> Our best understanding of teacher knowledge is a narrative one (Carter, 1993; Clandinin 1986; Connelly and Clandinin, 1990; Elbaz, 1993). In this view of teachers' knowledge, teachers know their lives in terms of stories. They live stories, tell stories of those lives, retell stories with changed possibilities, and relive the changed stories. In this narrative view of teachers' knowledge, we mean more than teachers' telling stories of specific children and events. We mean that their way of being in the classroom is storied: As teachers they are characters in their own stories of teaching which they author (Clandinin and Connelly, 1995, p.12).

Jean Clandinin and Michael Connelly have been further companions in my study. I was first drawn to their work for practical reasons: they are researchers of teachers and their experiences and they use narrative methodologies to shape their work. Also, they are teachers turned teacher educators rather than therapists or anthropologists. While I notice the significance I once attached to such labels is evaporating as I leave them exposed, and I begin to wonder if we are all perhaps all of these things some of the time, there is some comfort in the more familiar territory of an educational context with teachers and children as fellow travellers, and school days to look back on, and classrooms to re-imagine.

Speedy says she finds the work of Jean Clandinin and Michael Connelly 'sustaining' (Speedy, 2008, p.46). For me, it is this, and grounding too. It helps to tether the awarenesses I am creating and make them tangible. The tethering threads Jean Clandinin and Michael Connelly offer, the ones I would like to consider now at least, are theoretical and conceptual ones. In *Teachers' Professional Knowledge Landscapes* (Clandinin and Connelly, 1995), they explore the stories teachers live on the landscapes of their complex professional environments. They seek to know more of the significance of these stories in understanding teachers' narrative

knowledge. They introduce the metaphor of a funnel as a conduit in order to consider the 'theoretical knowledge' and 'abstract rhetoric of conclusions' funnelled into teachers' lives (p.12). In *Shaping a Professional Identity: Stories of Educational Practice* (Connelly and Clandinin, 1999) they build on the 'narrative educational concepts' of 'personal practical knowledge' and the 'professional knowledge landscape' in order to further understand 'teacher knowledge' (p.3). Through listening to teachers they make a link between knowledge, context and identity and pursue this connectedness to come to know more of how teachers' 'identities are composed, sustained and changed' (p.4). They take time to focus on the stories teachers tell and adopt the phrase 'stories to live by' to refer to the identity teachers establish for themselves through the construction and telling of secret, sacred and cover stories (p.4). In *Narrative Inquiry: Experience and Story in Qualitative Research* (Clandinin and Connelly, 2000) they share a framework they refer to as 'a three-dimensional narrative inquiry space' as they explore and explain how they work as narrative inquirers in the field (p.49).

Jean Clandinin and Michael Connelly write to exemplify how they use their frameworks in their inquiry processes and how their inquiries are their frameworks; rather than seeking to define narrative inquiry they show what it is that narrative inquirers do. I found their approach difficult to grapple with initially. Whereas Raimo Kaasila frames his work in a highly structured way, Jean Clandinin and Michael Connelly develop looser frames alongside their practice. For me their theory and their practice are so entwined they are almost of the same ether, so much so, that initially I considered they did not actually have theoretical and conceptual frames but that they just told stories of practice. To a degree this did not feel researcherly enough and the perceived lack of academic authority was unsettling. However, my interest in their work has persisted and grown and for me their ideas have longevity. Teachers are positioned as knowers in their work; they are listened to rather than done to. While the researchers have an aim in mind concerning the knowledge they would like to

establish, there is a sense this is achieved conjointly. Jean Clandinin and Michael Connelly talk of the 'reciprocity in telling and responding that is relational' (Clandinin and Connelly 1995, p.155) and the idea of a relational way of knowing captures the connectedness of their work, as they seek to see from all perspectives all of the time. They are content to stay with the complexity of teachers' lives and do not look to distil and fragment. They tussle with dilemmas, boundaries, shifts, conflicts, moral and epistemological implications, desires, tensions and possibilities. They tend to stay in the field for a long time, 'in the midst', immersing themselves in places of stories (Clandinin and Connelly 1995; Clandinin and Connelly 2000, p.63).

Drawing on 'Dewey's theory of experience, specifically with his notions of situation, continuity and interaction' (Clandinin and Connelly 2000) inquiries are seen as travelling in the three-dimensional narrative inquiry space – 'inward, outward, backward, forward' and always 'situated within place' (p.50). Jean Clandinin and Michael Connelly use a set of three terms to give axes to this metaphorical space: personal and social (interaction); past, present and future (continuity) and place (situation) (pp.49-50). The framework recognises any particular study as focusing on the personal and social, having temporal dimensions and occurring in specific places or sequences of places. However, Jean Clandinin and Michael Connelly do not view this structure as 'an analytic frame for reducing the stories to a set of understandings'. Instead the dimensions are seen as 'directions or avenues to be pursued in a narrative inquiry' (p.54). It seems to me there is great potential in not reducing stories to their fragments but instead in making a commitment to staying with the whole. Staying with the whole shape of people learning to learn and teach mathematics feels important if we are to move away from a deficit model of teacher education where we are inclined to imagine we need to fill what we think is not there, rather than to work alongside each other with what is there.

Jean Clandinin and Michael Connelly (2000) explain: 'Being in this space is complex for the narrative inquirer because all of these matters are under consideration all of the time' (p.56). In depicting how narrative inquirers do what they do they describe a group of researchers in the throes of their work:

> The conversation goes on, as they weave their talk across their own childhood memories, their student stories of remembered classrooms, their sharing of transcripts from ongoing research projects, one story calling up another from one or another of them, from their pasts, from the data they had collected. And story fragments become 'stitched together'... 'as we slide backward and forward temporally'... what starts to become apparent as we work in our three-dimensional space is that as narrative inquirers we are not alone in this space. This space enfolds us and those with whom we work. Narrative inquiry is a relational inquiry (pp.58-60).

They reflect on the way they work and note the meeting of their past, present and future selves as they inquire into the experiences of others. They open their work to others so meanings as yet unconsidered might be brought into focus and air other tellings. For them, working in this way honours the awareness that we are helping to 'make the world in which we find ourselves' as we are not

> merely objective inquirers, people on the high road, who study a world lesser in quality than our moral temperament would have it, people who study a world we did not help create

and as such they see researchers as 'complicit in the world we study' (p.61).

I am reminded of my past experiences coming to bear on the present and what I hear in the stories of the people I work with, how I hear them, interpret them and tell them. I wonder if this blending can help me know of the experiences of others learning to learn and teach mathematics and am aware of the fragility of meanings we might be tempted to divine from our narrative knowings. I notice I carry some of my stories of experiences with learning mathematics with me; they are boundaried by time and place but they persist:

Jackie: you can do this you just need to practise

Me: I can't do it . I don't know how to . you do it differently to how Mrs Gardiner does it .

put the zero down . two times four is eight . two times two is four . then two times four is eight and two times two is four . add them together . nought add eight is eight . eight add four is twelve . two down . carry the one . four add one is five . five hundred and twenty eight . twenty four times twenty two is five hundred and twenty eight . that one was easy . there was only carrying in the adding part .. I get confused when there's carrying in the timesing part . look . in this one . three times seven is twenty one .. what do I do with the two?

Jackie: you put the two down there under the line in the hundreds column . that's it . carry on

Me: ok . and then three time four is twelve

Jackie: and now you have to add on that two so it's fourteen . put the four down and carry the one under the line in the next column

Me: and then add it in next time?

Jackie: yes . you've got it

Me: so sometimes I have to times and sometimes I have to add?

Jackie: yes . you have to add the numbers in when you have carried them under the line

Me: ok ... three times eight ..... twenty nine

Jackie: hang on, three eights are twenty four

Me: I know . I added in the five that I carried from seven times eight all in one go

1983 Form 1,2

Caroline always tries hard and is making pleasing progress within the group. She could, however, work a little faster at times.

Mrs Brown

1984 Form 2,2

Coursework 89%

Position 20/29 in 1st set of 5

Caroline takes a lively and cheerful part in lessons, is gaining in confidence and making good progress.

Mr Brown

1985 Form 3,2

Caroline always tries hard and is making satisfactory progress within the group.

Mrs Brown

Mr Deft: right, this is something you'll all be familiar with, factorise y squared add five y add six .... anyone? what did you get? ... yes?

Me: that'd be open brackets . y add three . close brackets . open brackets y add two close brackets ... and then you do FOIL so y times y is y squared, y times two is two y, three times y is three y and two times three is six, so that's y squared add five y add six

Mr Deft: .....why did you multiply the brackets back out?

Me: to check if I'm right

Inward, outward, backward, forward.

In *Teachers' Professional Knowledge Landscapes* Jean Clandinin and Michael Connelly (1995) enquire as to:

> how the embodied, narrative, relational knowledge teachers carry autobiographically and by virtue of their former education shapes, and is shaped by, their professional knowledge context (p.3).

They argue to make the case 'it is not only an understanding of teacher knowledge and the education of teachers that will make a difference but attention to the professional knowledge context in which teachers live and work' (Clandinin and Connelly 1996, p.24). They seek to 'contextualise teachers' personal practical knowledge' (p.24) and it is as if their work has been written to help me communicate the stories shared with me, the ones Paula and Izzy and Laura and Holly and Sam and I made together.

Laurinda Brown and Alf Coles

Over time, Laurinda and Alf have written regularly about their work, and they continue to do so, sometimes together, sometimes individually and sometimes with others. I have chosen to attend to their work because they span the distance between their mathematics teacher educator and academic researcher roles with graceful ease. However, I do so with some hesitation because they often describe themselves as researching from an enactivist perspective (see, for example, L. Brown and Coles, 2011; L. Brown, 2015; Coles and Scott, 2015; Coles, 2018) and this word, enactivist, gets in my way. It represents both a vast body of knowing and a vast body of doing and, although when I read their work I feel a connection, at the same time I know an unbridgeable gulf. Here I focus on their explorations of their 'theories-in-action' (L. Brown and Coles, 1997, p.113) in some of their earlier work. My end-in-view is to know something of their *hows* and the establishing of them. I am not sure if this is an attempt to forge a greater connection between our different ways of seeing and knowing and doing, or an attempt to see and know more of what it is like to be at someone else's beginnings and travel with them in becoming. Probably, it is all of these things.

I notice how Laurinda and Alf employ narrative approaches in working with teachers as they tell stories of their classrooms in interviews and in seminar-based conversations. They situate such stories of practice alongside tellings and re-tellings of stories of their own practice and view the creation of narrative forms as important for establishing a holistic sense of their interests and for providing impetus for further action (L. Brown and Coles, 1997).

In her research leading to the article *The influence of teachers on children's image of mathematics* (L. Brown, 1992), Laurinda set out to explore the possibility of a connection between the way in which a teacher viewed mathematics, and the way in which the children that teacher taught, viewed mathematics. Laurinda gives detail of her beginning research methods, describing the use of reportive statements, rather than interpretive and prescriptive

ones, alongside semi-structured interviews based on a guiding script. To explore points raised by teachers in interviews, Laurinda asked 'for stories through which to probe the underlying tenets' (p.31). She noticed patterns across the stories told and shaped the question *'Is this a classroom in which it's all right to be wrong?'* (p.29, original italics) to frame her analysis of observed behaviours. Through the 'filter' (L. Brown, Hewitt and Mason, 1999, p.85) of this question she identified behaviours which felt comfortable, such as 'children being open about sharing their ideas – justifying them, yet letting go of or refining them if they proved less than satisfying' and behaviours which felt uncomfortable, such as children asking '*Is this right?'* (L. Brown, 1992, p. 29, original italics) on completing a question. Laurinda concluded a teacher's image of mathematics did indeed seem to influence the image of mathematics their children described.

Noticing and working with comfort and discomfort, or resonance and dissonance, continued to be an important feature of Laurinda's work, as a mathematics teacher educator and as an academic researcher. In her work with Dobson (L. Brown, 1996) she described her way of probing through the use of story as 'progressing from a consideration of *experiences*, via the formulation of *issues*, to the delineation of possible *actions*' (p.212, original italics). In working with dissonance in experiences, Laurinda saw potential for 'deeper and deeper insight into one's implicit theories of teaching and learning' with the possibility of then 'altering consequent behaviours' (p.212). She argued staying with the detail of classroom happenings was important in becoming aware of 'the grit in the oyster' (p.213), the irritant causing dissonance. In staying with the detail, Dobson and Laurinda explored the grit of 'a sense of rightness' shaping his practice (p.224). Dobson began to notice aspects of his practice he had not been aware of before: sometimes he helped children to get sums on a page right by telling rather than teaching; sometimes he pushed children along channels towards goals he wanted, the, in his mind, "right" goals. He also noticed he used the word "right" a lot when teaching. On becoming aware of these behaviours he began to question if the image of

mathematics he might be holding up for children, an image communicating a sense of there being a *right* way to do mathematics, was a helpful one to hold up, or if there were other possibilities.

When Laurinda and Alf began working together, through the process of staying with the detail in stories of experience, Alf became differently aware of his use of talk and the impact it had on what happened in his classrooms (L. Brown and Coles, 1996). He identified a possibility in the use of silence when working alongside children in their learning of mathematics noting:

> forcing myself to hold back the analysis and stay with just the stories about individuals or groups the analysis from this data then has the possibility of throwing up something I had not been aware of before (p.151).

Interested in describing the process of working from experiences to issues then new actions from a theoretical perspective, Laurinda outlined a hierarchy of learning strategies (see Nisbet and Schuksmith (1986)) as a frame for her developing thinking:

> At the most general level there is a *central strategy*, an overall style or approach to learning, which is closely related to attitudinal and motivational factors. Then come *macro-strategies*, which are executive processes linked to cognition and knowledge. These are highly generalisable; improve with age and experience; and can in principle be developed through training, though this may be difficult in practice. Lastly there are *micro-strategies* which are less generalisable, more task specific and easier to teach or train (L. Brown, 1996, pp.224-225, original italics).

With her focus on processes of teacher development, Laurinda viewed central strategies, guided by philosophical positions or beliefs, as difficult to change as they are often

unconscious (L. Brown and Coles, 1996). However, she saw working with teachers 'in the middle position between philosophical attitudes and teaching behaviours' (L. Brown, 2005, p.1), at the level of macro-strategies, as having potential. She explained:

> the intention became to develop ways of working with trainee teachers so that they could find their basic-level categories, or purposes in my model, which they might be able to use as filters (L. Brown et al., 1999) to develop a range of effective (for them) micro-strategies with a consequent adaptation of central strategy where appropriate (L. Brown and Coles, 1996, p.146).

Laurinda and Alf, recognising 'overlaps and parallels' in their 'concerns and developing theories' (L. Brown and Coles, 1997, p.114), went on to further their thinking about working at this in between place, coming to frame purposes as:

> the distillation of a complex web of intentions, thoughts, past experiences and actions which inform my practice (L. Brown and Coles, 1997, p.117).

Of particular importance to Laurinda and Alf is the generalisable quality of purposes. They view this quality as important because 'No two events or responses are ever quite the same in the classroom' (L. Brown and Coles, 1997, p117). In addition, teachers themselves, out of their own interests, form purposes. In this way, purposes hold particular meaning for an individual teacher and are personal, not handed down via the conduit. Laurinda and Alf suggest purposes are therefore motivational (L. Brown and Coles, 1997). It is, for example, perhaps possible to imagine Dobson shaping a purpose serving to highlight being right in

mathematics lessons differently and Alf making conscious use of silence when working with others as a result of their examinations of practice.

Laurinda and Alf's 'theories-in-action' (L. Brown and Coles, 1997, p.113) resonate across the experiences and issues and actions I have talked of so far in my study: the dissonance in my interactions with Izzy and my interviewing techniques; the resonance with narrative ways of seeing and knowing; the storying of the small, so small to be almost miss-able, details which seem to herald change. These experiences and related issues supported the development of new actions: asking interviewees for further detail of their experiences, choosing not to talk, remaining calm in a pause. As I saw my new actions producing different results I recognised and questioned beliefs associated with the nature of knowledge and reality and began to notice how small shifts in my central beliefs moved me to new thoughts then actions and so my experiences were reshaped again.

Laurinda and Alf use the word 'subordinate' to describe a process by which the teacher in a given situation is able to relinquish their aims allowing 'the accumulation of experience which can condense into educated intuitions and is a continuous process of learning for us as teachers' (L. Brown and Coles, 1997, p.119-120). I notice a semblance of purposes distilled in my subordinations: talking to listening, certainty to uncertainty, fast to slow. Such purposes, or distillations 'of intentions, thoughts, past experiences and actions' informing practice (L. Brown and Coles, 1997, p.117), speak to the future; they wonder what practice could be like and hold the potential to shape what continues. It seems framing development through a lens of purposes, could offer a flexible framework for future action enabling a practitioner to continue in the complexity of classroom moments without the need for prescriptions, remedy A for situation B, which would require a huge amount of categorising and labelling and for which there would always be subsets of subsets. The process of establishing purposes is not the same as one of 'anticipatory reflection' as outlined by Lutovac and Kaasila (2014) in which a focus on 'future views about oneself' are seen as motivations but more a forward

looking stance concerned with future *hows*. Neither do purposes feel like stories to live by in a process of becoming as outlined by Clandinin and Connelly (2000) as becoming, while implying continuity to a degree, also implies there is something defined to become. They are perhaps similar to M. C. Bateson's improvisation and G. Bateson's transference as these ideas speak to ways of knowing in the unknown of the imminent and so recognise a continuity without an end point. From an enactivist perspective purposes are 'motivations to act' (L. Brown and Coles, 2006, p.97). From a narrative perspective, purposes, it seems to me, are imaginations, small stories of possibility.

Part Two

Stories on the Landscape of Primary Mathematics Education

A technique I have learnt in yoga is to pause periodically.

To stand in Tadasana in the middle of my mat, still and steady.

Pause.

Take a breath.

And restate the intention set at the beginning of my practice, in order to continue with renewed calm, clarity and focus.

While Paula and I have our own stories of becoming primary mathematics specialists, they are well rehearsed and fluent, with one event appearing to lead fairly unproblematically to the next. From this vantage point it is impossible to recall the detail of the development, with the bumps in our instinctive, haphazard progress smoothed by time:

> I became aware that I couldn't get a handle on their learning and felt I wasn't teaching anything so I changed things in my class . I realised I had been going on instinct (Paula, Interview, February 2016)

The temporal nature of experience alongside limited awareness in the academic arena of primary teachers who have confidence in, and a passion for, the learning and teaching of mathematics are issues, which have shaped my research interests. My aim is to learn more of how people become primary mathematics specialists and some of the detail in their journey of development. In essence I wish to learn from the experiences of mathematically minded, early career teachers. My motivation? I hope to contribute to the field of mathematics teacher education, by offering new awarenesses contributing to knowing more of how we might support people in pursuing their interests in primary mathematics, as they continue their careers. I want to listen to, and tell the stories of, postgraduate and newly qualified teachers who have an interest in mathematics, to learn by stepping into time and placing stories side by side, whatever those stories might, or might not, be.

Introducing Laura, Holly and Sam

Dear Postgraduate Teacher,

Thank you for contacting us with your request to apply for a place on our mathematics specialist route. Please write an Expression of Interest in which you tell us a little about:

- your understanding and enjoyment of mathematics as a learner of the subject;
- the beliefs and values about the learning and teaching of mathematics you hold;
- the opportunities you have taken to develop your interest in the subject beyond your own education at school.

We look forward to hearing from you

From the Primary Mathematics Team.

Being good at maths has helped me be successful in my daily life and in my career. I have the skills and competence to manage practical aspects of money and time and a logical approach to refining systems and increasing productivity. At school I was good with number and learning techniques, and enjoyed knowing instantly if my answers were right or wrong. However, I dreaded 'real-life' problems until a 'click' moment in Year 9 [aged 13] when I could see how to apply my knowledge to these problems. This gave me tremendous satisfaction as I could appreciate the wider purpose of my studies: my attainment and enjoyment increased dramatically, prompting my decision to pursue A-level.

I like the emphasis placed on supporting children to gain fluency through teaching techniques, alongside application of the procedures in real contexts, in schools now. I think a focus on developing a deeper conceptual understanding of maths at primary school would have really helped me. Recently I was supporting some Reception [aged 4] children to build a rocket: one child asked another to 'cut the flames five'. He was referring to his vision for the length of a paper flame. I was interested to hear his early attempts to communicate his vision through numbers and to recognise the role of measurements. At playtime I have noticed the frequency with which children count in their games. I think the shared language of maths is incredibly important. By establishing a grounding in maths at a young age, teachers can help children to develop a deeper understanding of their surroundings.

(Laura, Expression of Interest, February 2015)

I was disappointed to learn people can feel high levels of anxiety when approaching maths as I believe it is something every individual can enjoy and succeed in and so have a confidence that remains with them throughout their life. Maths is not only relevant to education but is essential to life, as all will deal with time and finance and need numerical skills. We must introduce children to maths with the hope we prepare them to correctly implement their mathematical understanding. I strongly believe maths is a discipline in which all can excel, as most maths problems can be broken down into manageable addition, subtraction, division or multiplication sub-questions then pieced together in a logical fashion - it is just a case of trusting the process and making a start. Maths was one of my favourite subjects at school and my degree in geography involved data analysis, so the statistical component of my maths A Level was brought into a fresh and exciting context. This experience reaffirmed my conviction that to excel across curriculum subjects, an understanding of maths is also needed at a corresponding level. I mentored a Year 7 [aged 11] boy recently and saw his low mathematical ability negatively impacting numerous areas of his education, leading to a growing disinterest in education in its entirety. This is a pattern I have noticed in many pupils and it has fostered a desire to learn to teach maths well: with effective teaching of maths, and practice, everyone can succeed.

(Holly, Expression of Interest, February 2015)

For as long as I can remember mathematical problem solving has driven me. At the age of six I loved sitting and working out Roman numeral sums my father set me for my enjoyment. From art to architecture, music to nature, maths lies at the heart of everything, and it is just as important in these ways, as it is for managing our day-to-day lives. As Strogatz (2014, cited in Lahey 2014) described, after observing pupils learning through their engagement with a puzzle, '...they were enjoying the struggle. They were feeling what anyone who loves math feels, the pleasure of thinking, the pleasure of wrestling with a problem that fascinates'. It is the feeling of pure determination and pleasure found in the thinking process itself that sums up what I enjoy about maths, not to mention the inevitable satisfaction when the hard work pays off and a solution is found. I hope to inspire pupils with my enjoyment of maths. Often, negative experiences of maths can discourage children and lower their confidence. My passion lies in helping pupils overcome barriers, such as low self-esteem or a fear of getting it wrong, to learning. I believe it is particularly important when teaching numeracy, students are reassured that making mistakes is a natural and essential part of learning; I would give praise for trying hard and good thinking, in equal measure to getting correct answers. In a recent essay titled *The Adult's Role in Aiding the Development of Mathematical Reasoning* I explored the work of theorists who discussed the importance of using concrete apparatus to display mathematical concepts. I argued props play a vital role, acting as a bridge from physical to mental understanding: if a child is pushed to move on before they have crossed that bridge, they will struggle to ever catch up. Not only are props vital to laying solid foundations of understanding, but they are also key to facilitating interactive, inquiry-based learning, at any age. I have also pursued my interest in maths by becoming a Numeracy Coach assisting in secondary schools to give pupils the extra attention they needed to boost their abilities. I found it incredibly rewarding to be told by students they could now do things they had never understood before.

(Sam, Expression of Interest, February 2015)

Day One

Each new academic year I begin our first session with the same request: can you introduce yourself to the group and share what brings you to this room today, so making you part of a group of postgraduate teachers who have opted to take a specialism in primary mathematics? The postgraduate teachers present will have written an Expression of Interest in order to be considered as a person who might be accepted onto the route and I will have read and thought about them back in the summer. I will not try to match those documents with the people as they talk, although sometimes someone will say something and I will recall having read a little about that previously.

There will probably be about thirteen of us in the room, one mathematics teacher educator, the rest postgraduate teachers. Usually one of the postgraduate teachers offers to respond to my prompt although sometimes I ask the person to my left if they would be happy to start (they always are). I have come to notice a pattern is set by the person who begins: if they keep their story short and to the point, all of the stories tend to be that way and this introductory telling lasts just twenty minutes or so. If the first person chooses to offer more of their life history, this session takes us to coffee. I have also noticed there are many similarities in the content of the stories told in that moment. We find we are a group of people who have positive associations with mathematics. We might “love it” or “enjoy it” or find it “fun”. All of us can trace paths of mathematical success defined by examination results although for many this trajectory falters at some point in the A level years. Despite some successes in the education system, many of us know “we’re not the best mathematicians”; we are aware there is much mathematics we “don’t get”. Many other people are brought into the room: amazing teachers, and terrible ones, supportive parents, future employers, friends and colleagues who struggle with mathematics and have benefitted from our help, our own young children who are just learning to count.

Without question, the postgraduate teachers all want to be able to teach mathematics well; they want the children who will be in their classes to enjoy mathematics and be successful as a result of their teaching; they want to support their fellow postgraduate teachers because they know some of them may well "hate maths". They want to make a difference.

Talking with Laura

Talking with Laura happens in a rush. There is barely time to think. Often we finish each other's sentences, second-guessing what will be said. The interviews are hard to transcribe as it can be impossible to determine who said what when, and in which order. After a while my interjections reduce as I learn to stop myself immediately I notice we are talking over each other, as I learn to let Laura speak. Taking a wide view of the transcripts of our conversations spread out on my desk I notice how, in between more extended periods of talk from Laura, there are often lengthy sequences of short interchanges where little of any substance is said. I wonder if in these periods we are thinking ahead, forming what we will say next, and if these staccato backs and forths are techniques for buying thinking time. I could do some number crunching but my guess would be interviews with Laura lasted longest and had the greatest number of words spoken. There is also probably most laughter in these: we hit it off; we have similar ways of communicating and explaining what we do in our classrooms. Laura is keen to do well, wants to do it right and be noticed for doing it right and she has the courage of her convictions about what is right. I sense a striving in her and it reminds me of me. Over time I think we both managed to slow down a little in the interviews, relax, not worry that there was some end goal we were hurtling towards. Not feel we needed to fill silences with words.

The stories I want to tell you about Laura, the ones I hear in our interviews and see in my transcripts, are stories about the way she approaches teaching mathematics with her children. I want to tell you about how her knowledge and understanding of subtraction has changed recently and about the friend she sat next to at primary school. I want to tell you I think she feels isolated in her work and that she is reinventing and relearning mathematics

from the new perspective of primary teacher, without the discussion and collaboration she hoped for. I am intrigued to notice beads being strung:

> Me: ok umm .. err this is err slightly different and .. you may mention may build on something you've already mentioned but I was wondering if you could tell me a bit about an early experience of learning maths that you had . one that feels quite vivid to you that you could give me a bit of detail about
>
> Laura: …… mmm …… I can't remember anything . I remember being really confused by subtraction
>
> Me: oh yes
>
> Laura: when I was in infant school because I couldn't work out which number to start on and I remember I was often one out (ok) and I don't think anyone ever kind of took me back to using counters I was a top table kind of child so I was meant to know (ok) so yes I remember just keeping on looking at it and thinking "oh ok so I can just add one at the end" and then umm then I'd get it (ahh) or I could subtract one at the end and then I'd get it
>
> Me/Laura: so roughly what/and I'd compare my answer to Susan Small who sat next to me [laughter] and (brilliant) all my answers were one higher so if I just removed one (that will make it work) that will make my subtraction right yes
>
> Me: ahh clever
>
> Laura: but it was I'd say kind of "seven subtract three" (mm) so I'd I'd go back and I'd get to five cos I'd say "I've got seven and six and five"
>
> Me: yes so you'd start counting on the seven maybe?

Laura: yes

Me/Laura: “seven, six, five” and then Susan Small would have four / and Susan Small would have four [laughter]

Laura: I’ll never forget her surname cos it was infant school [laughter] so I’d subtract one from my answer and then I’d get them right (yes) and the teacher thought I’d cracked it at that point

Me: so when did you . how old were you do you reckon . roughly what year

Laura: mmm year one or two

Me: wow

Laura: yes

Me: and it . so when do you reckon . you know . looking back on that as an adult now when did you .. realise that’s what you were doing?

Laura: well no I kind of knew at the time

Me: oh ok

Laura: I was always quite a logical child (yes) so I’d work out what I was doing I didn’t necessarily know why other than I knew that that made the answer (ok) if I took hers and I can remember thinking I never understand which number to start on (ok) and it never ends up quite there

Me: so you could . it could have . you could have been trying to do three subtract seven in that example is that what you mean by which one to start on?

> Laura: no I knew to start with the bigger number (ok) but I don't think I understood that it was the same as .. finding .. the difference and having a three and having a seven and counting (ok) the numbers in between or having seven and taking three away (yes) I don't think that was really .. secure so I just knew that I had this seven and then I had to count back three (yes) so I (it's what you did) started from my seven yes and it was just a bit of a lie it wasn't three it was always one more
>
> (Laura, Interview 5, October 2017)

What are the stories about this lit up moment I will tell?

…… mmm ……

hesitation is unusual for Laura

… I can't remember anything …

I remember being really confused by subtraction

the story tumbled out

and our ping-pong match began

There are many reasons for me wanting to capture this moment from the series of interviews I made with Laura. First of all, it illustrates some of the typical patterns in our communications: the fluency Laura has in her retellings and my frequent back channel affirmations. I have tidied the transcript a little, so you might be able to read it more easily, but I have tried to capture something of speed and hesitancy, something of the moments when our words and thoughts collide with each other and I have borrowed the / from Bukowski (2002) to help me say these spillings of one into another. I am starting to hear when people slip into moments of autobiographical narrations of their lives:

I was a top table kind of child

the teacher thought I'd cracked it at that point

starting to see these snippets as time travel portals connecting then with now. I am starting to see how versions of the past will always, always be changing as the present comes to bear on historical time (Freeman, 1998). Only a teacher could add that commentary.

However, my main intention now is to place some stories on the landscape of mathematics education, so I am also interested in the way Laura's story of learning to subtract with Susan Small, mirrors something of the culture of learning and teaching mathematics Laura is creating in her first classroom. Laura values children's thinking. She wants her children to be able to use their mathematical knowledge and understanding creatively. For her, being mathematical is not just about getting the right answer. She emailed me one day:

> Hi Caroline,
>
> Our printer was being silly earlier this week, so as a two-minute filler I asked my class what made a good mathematician. I am so so pleased with their responses…. Hooray!
>
> 
>
>
> Laura
>
> (Laura, Email, April 2017)

Also, I would often ask Laura, Holly and Sam to tell me about things they had been working on with their children and Laura gave descriptions like this:

> they had a big bit of sugar paper and I had a vague idea that they were going to create a wall and then we could talk about it . I put zero . one and two on the board and that was their kind of … muse … that they could work with and then they talked about it in groups and there were various fractions around the room and some had questions on them . things like . "if I have one and then I added a half what would happen?" and some that said "if I had four eighths and I added one half what would happen?" just to kind of spark ideas but it was kind of up to them where they took it (Laura, Interview 1, March 2016)

> they were only meant to be looking at measurements of the new playground equipment and working out what they wanted to measure based on a loose brief and they decided they'd measure the whole playground so they could work out how much was painted and how much wasn't painted ____ so they'd started by just measuring the painted areas ____ and then just gone beyond ___ they were really interested in it and really excited about it and they were showing other children how to use their metre stick to measure spaces bigger than a metre and that was quite nice because they were looking to share their own findings (Laura, Interview 2, June 2016)

> we were looking at how to adjust numbers to help with mental addition and subtraction methods .. a lot of the children started off and they said "well you add the ones and then you add the tens because that's what you do in column addition and column subtraction" .. so we were insisting that they worked in fours or fives today and each of them worked independently but

> then they all had to exchange methods and understand how each other worked so they couldn't keep using the same idea again and again or we'd say "oh let's have a go with Caroline's method now and see if you can work out how that one might help you here" or "how might Caroline's method work with this question but not so much with this question" (Laura, Interview 4, May 2017)

These windows onto her classroom help me to see how Laura likes to offer a starting point her children can take in different directions. She wants to see what mathematics they bring and work with that. For Laura the direction of flow comes from the children. Her descriptions suggest a belief people learn mathematics by doing it, thinking about it, having ideas and posing their own questions; that mathematics is around us, a natural part of our lives. Laura is also interested in the teacher's role in shaping learning opportunities and how she might refine the choices she makes:

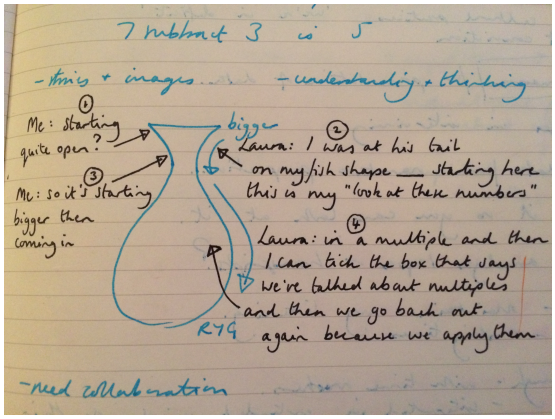
> knowing how much stimulus to give and not to give cos ultimately we still only have an hour to do maths in the classroom . so . yes . how you could give stimulus to speed it up slightly because probably if you left children in a room they would get onto maths at some point (Laura, Interview 2, June 2016)

I wonder if she has heard the idea about monkeys and typewriters and Shakespeare.

Over time Laura's way of approaching the learning and teaching of mathematics took a more defined shape: a fish shape to be precise:

> Me: so you're quite happy to take quite a flexible approach to planning? It's reminding me . you spoke earlier about working on multiples and that you might ask children to look at some numbers you're going to work on

Laura: I still have to do a WALT but it would arise during that lesson and by the plenary stage we would be talking about what a multiple is but I wouldn't start by saying "a multiple is…" I would start with a more "have a go, explore" it's not like I'd say "these are multiples" …… it would be a fish shape if it was a shape



Laura: this is me playing within the rules I think because our lessons do sometimes go on a tangent so that's my chance to bring it back because ultimately these are the questions someone will ask if they're trying to find out if I have taught multiples which we do cover … the planning fish (Laura, Interview 5, October 2017)

Laura's flexibility and her intuitions about how people learn and what learning in classrooms is for, indicate something to me about her mathematical subject knowledge. As outlined earlier, the idea of a teacher needing a particular knowledge base, one that is something other than the knowledge of a subject a person leaves their own schooling with, or acquires in their daily life, is a significant one in teacher education (Shulman, 1987; Ball, Thames, and Phelps, 2008; Rowland and Turner, 2008; Ma, 2010). What struck me about Laura's view of her knowledge of primary mathematics was she saw it as secure enough for her to take her lead from the children, to make an offer and see what happened, and I think this is unusual

for a postgraduate/soon-to-be/newly qualified teacher. It would seem Laura's security in her subject knowledge had an influence on how she was able to work mathematically with her children.

> Me: thinking back to that lesson . are there things that stand out in your mind that would illustrate your strength in subject knowledge?
>
> Laura: I guess part of it would be that even though there was this idea of a fraction wall it was quite open so I didn't stand there and say "right . here is a pizza and if I cut it in half it will be a half and if I cut it again it will be a quarter" so there wasn't anything along those lines
>
> Me: so you had the depth of subject knowledge which enabled you to design a task that was less about the teacher giving procedures and more about the children .... doing ....
>
> Laura: that's why I think it was strong subject knowledge . rather than it being "this is what I want to talk about, this is what I know about, I don't want them to go on any other route"
>
> Me: they could have gone anywhere but you could cope with them going anywhere because you've got the subject knowledge that allowed you to be able to work flexibly?
>
> Laura: yes
>
> Me: rather than on a ... more narrow path ... is that, am I using the right words to

> Laura: yes . I think so . I wasn't so restrained by "this is the particular learning objective that we are going towards" even though eventually I was looking to look at how we add or take away or subtract
>
> Me: that's very interesting hearing about you being able to work in a more open . flexible way because you feel safe that you can respond . that's a really nice way of thinking about what . what strong subject knowledge is I think (Laura, Interview 1, March 2016)

Having read early career teachers were perhaps not interested in, or aware of, a teacherly subject knowledge base (Allen, 2010; T. Brown and McNamara, 2011), I was keen to explore the views and experiences of Laura. Perhaps prompted by the story of Susan Small, Laura talked about subtraction on a number of occasions:

> Me: would you say that your subject knowledge has changed since coming on the PGCE and if so in what way?
>
> Laura: I think it's partly just being able to look at things from different angles so even basic things like subtraction which I'd naturally been able to answer but I hadn't realised it was two different ideas . so if you had five sweets and I had three sweets with find the difference you actually need eight items to show that but if you have five sweets and I eat two you'd only need the five and there were lots of things like that that I'd just not thought about previously … so I think that's the main way it's changed . it's not so much the amount I know it's the routes into it and the bits that come off it
>
> Me: one of the ideas about being a primary maths specialist is that you have depth of subject knowledge so is that an example of "it's still subtraction and I

get subtraction and I can do subtraction but I now understand something different about subtraction that I didn't understand before"

Laura: yes . it's more the unpicking

(Laura, Interview 1, March 2016)

Laura: subtraction has changed a lot in my mind this year . I didn't really realise there was a difference between "find the difference" and when you take one number away from another I'd not really thought about that but it could have a massive impact so if I can look into those misconceptions for myself but also for the children then … I don't know … it's another level of conversation I can add (Laura, Interview 2, June 2016)

Laura: I remember going home after our subtraction lesson at university . I didn't quite understand subtraction until my PGCE year because I'd not realised there were these two types of subtraction and that was pretty fundamental

Me: and I guess now you have that awareness when you do subtraction with your children presumably that looks quite different?

Laura: we do a week on each because they are different and part of their starter might be "is this find the difference or is this subtraction?" we did quite a lot last year of demonstrating and acting out so seven subtract four really basic questions that they could all answer . as opposed to six year old me . so that they could look at it in different ways

> Me: so looking back that six year old you I wonder what your teacher could have done that would have helped you?
>
> Laura: I think I needed to act it out so the literature side of me needed stories to make it real
>
> (Laura, Interview 5, October 2017)

I can imagine a PhD student in twenty years times asking Laura, as an established primary mathematics specialist, how she came to be so and the story of "how I came to know subtraction differently" being a bead on the string. I am starting to see how versions of the past might always, always stay the same and how the future is in the present. The story of knowing subtraction differently is becoming stitched into Laura's fabric along with Susan Small and the great teacher who made mathematics meaningful and believed in every student.

These insights into learning and teaching mathematics in a primary classroom speak of the learning an early career teacher has to do. A relearning of fundamental mathematical concepts and a learning about how to get them across to young people through lesson structures they feel comfortable with, ones honouring beliefs held about the way children learn and what they want to offer the young people in their care. What I think I have not appreciated before, not had a sense of before, is how alone teachers are in doing this work. The isolation Laura felt came through strongly in the later interviews we made, the ones towards the end of her newly qualified teaching year. In the first two interviews, when Laura was in her postgraduate year, she had a network of peers and tutors, a group of like-minded primary mathematics specialists and school-based training mentors to work alongside but once in her classroom this network all but vanished. There were passing conversations with parents, the teaching assistant she had with her on some mornings, her colleague in a classroom upstairs who had helped her when she had needed to unpick how to teach

rounding, the school's subject leader for mathematics based at the Infant School site down the road. The Head teacher was a distant figure shrouded in mist that seemed to know something about the way Laura taught, although Laura was not sure how this was possible. When I asked Laura at intervals over our time together what would help her develop her specialism further, she always mentioned other people:

perhaps we could have additional visits from university tutors

or

establish a network of teachers interested in mathematics to bounce ideas around with

or

set up social media groups if people are unable to meet face to face.

Hearing and seeing these strands again and again, people and not people, nourished and not nourished, I am left with a sense Laura found collaboration with others necessary for her work, not desirable or preferable but fundamentally necessary:

it's where I need the collaborative approach again

how can we figure this out?

how can we unpick this?

I'm not getting the feedback

there's no one I can talk to

there's no mixy bit

I'm doing it on my own

I do feel really quite disheartened

and just a bit lost with it all

Laura knew what she wanted to develop in her practices of classroom mathematics, what she wanted to learn and achieve in her newly qualified teaching year:

> to ask open-questions, to set open-tasks for group work and discussions, so children can challenge their ideas, be inspired, develop their curiosity and build rich connections … to support staff, read, attend workshops, have discussions with colleagues (Laura, Transition Training Plan, July 2017)

A heady list perhaps but one indicating this postgraduate/very-very-soon-to-be/newly qualified teacher is bringing knowledge, awareness of a need to develop, passion, care, drive, motivation and commitment to her first teaching post. It seems reasonable to imagine a person wanting to give so much also needing sustenance. By the following May, Laura was feeling the lack of nourishment keenly. The culture of learning Laura was creating in her classroom for her children reflected the culture she herself needed but the mixy bit, the bit where you got to discuss and bounce ideas around was absent for Laura the teacher/learner-learner/teacher. In the three times I visited Laura at her school I saw only the caretaker and a cleaner and heard the disembodied voice of a teacher in the classroom opposite as she and Laura had a passing conversation about an incident at swimming lessons earlier in the day. But schools out of hours are strange places and perhaps the empty corridors and echoing classrooms are overly influencing my re-presentation and I am in danger of giving a lopsided view. After all, it must be noted, this aloneness did pay some dividends: it meant no one else really knew what Laura was up to and this was helpful in navigating the conduit of the sacred stories shaping practices in her school, practices that did not always sit well with Laura. There are glimmers of this in Laura's illustration of her planning fish:

I still have to do a WALT

and then I can tick the box

that says we've talked about multiples

this is me playing within the rules

because ultimately these are the questions someone will ask

if they're trying to find out if I have taught multiples

This gentle playing within the rules was also evident in the way Laura overcame the mandate to group children according to their current levels of attainment:

> I hated the idea that we were going to have separate groups and that people would be stuck in these groups and that you didn't mix and you didn't talk to other people ___ I've been told I have to group them according to their attainment so they are in theory but because we're still in this joined up seating thing they're as close as I can get to merging them without actually merging them so that they are still alongside people who think in different ways (Laura, Interview 4, May 2017)

Having spent a little time with some of Laura's stories I would like to look wide again:

	Laura	**Holly**	**Sam**
Total length of interviews in minutes	238:34	247:38	179:46
Total number of words in transcripts	41590	46104	25204

I made this point before when considering Paula's specially selected beads but clearly within our two hundred and thirty eight minutes and thirty four seconds of talk and forty one thousand five hundred and ninety transcribed words, there are many other stories I could have picked to tell. Ones I might come back to later are about Laura's school-based training mentors (particularly Cathy); the ways in which Laura seemed to be forming her identity as a

primary mathematics specialist; or the parts of the mathematics specialist course that appeared to be shaping Laura's practice. I am also aware Laura might well have privileged threads other than the ones I have pulled. We were in touch not so long ago, she asked me how my PhD was going and I asked her if she would be interested in taking a look at the transcripts I had made to see what stood out to her. She said she was happy to consider this but I have not heard back as yet; I will let you know if I do.

Shifting sands.

My self-doubt creeps back in as I wonder, yet again, if I should be letting you know how much I do not know, that my research design was not stitched up nice and tight from the start but had a few holes, ones I can see more clearly with the benefit of hindsight. Is this instability problematic for research or important to raise awareness of? Perhaps it is inherent in any of the ways we choose to represent a distilled version of the whole, which any type of research conducted under any paradigm and viewed through any lenses must do. Despite occasional apprehensions such as these I also notice I am no longer just accepting the loss of certainty but enjoying it, finding greater possibility in wearing thoughts and ideas more lightly. Partly I am delighted to not claim these as the correct stories to tell, to not be sure these are the ones that occur most often and to not tell you these are the things you have to think about. I can only say, after taking some time to listen to postgraduate/newly qualified teachers who are interested in primary mathematics, these are some insights it feels significant to communicate. Stories of what they bring to their classrooms rather than what they do not bring. That is all.

While I have been busy with Laura I notice I have been accidentally developing my

what I want, how I want

research what you want, how you want

research what you want, how you want

and incredibly there is now some sort of pattern to my how.

Just as I read about "how to interview" I also read about "how to transcribe" and "how to analyse" and there are undoubtedly echoes of my reading and the ways of others in my ways. I told myself to transcribe interviews promptly after recording them so this meant listening across the grain of interviews made with different people at roughly the same time. I began by jotting down a running summary of interviews as I listened to them, trying to get a feel for what this data was, what it might help me come to know. Episodes within interviews have stayed with me from these initial listenings and I have fleshed out stories around them: Susan Small and her accurate subtraction, Holly's angles and Sam's blue fish (I know, more fish!). These early attempts at making transcriptions were painful and slow: in not knowing *what* to focus on or even *how* to focus on something I tried to focus on everything: individual words, sentences, my interjections, our pauses, Ella Fitzgerald singing Christmas songs, our laughter, their stories, their subject knowledge, our identity construction, … ___ / ; : ( ) [ ] { }. In the past, when I was a primary school teacher, I have been highly frustrated by children spending entire English lessons deciding on the names of the characters in the stories they were supposed to be writing; now I know how they felt and would be able to be far more patient with their indecision and appreciative of their desire to make just the right choice. Paula, Izzy, Laura, Holly, Sam. It took a long time to settle on those names. At one time pseudonyms piled upon pseudonyms and Laura was Laila, Holly was Beth and Sam was Sarah.

Having a complete set of interviews for each of Laura, Holly and Sam and listening along the grain of one person's continued story over time, on headphones while walking along well-trodden paths, offered a coherence to work with and I was able to notice patterns over time as well as the feel and rhythm of particular episodes. Once I felt familiar with full recordings,

with certain sections ringing more loudly in my ears than others, I began making complete transcripts. I found knowing the interview well supported the flow of transcribing words onto the page and helped me to stay with unfolding stories of experience and become absorbed in them. I notice I have gradually come to transcribe more purposefully although it is still not a quick thing to do. I fairly consistently transform around four to five minutes of recording in half an hour of listening, typing, listening, typing. I notice Sam's transcriptions being quicker to make than Laura's and Holly's

	Laura	**Holly**	**Sam**
Approximate number of words spoken per minute	174	187	140

and this is probably why.

In my transcripts I aim to make a fairly full representation of what was said, in terms of the actual words spoken at least. I also like to get a measure of the speed of talk, was it all-in-a-quick-string or slow .. and broken ... ? The length of dot dot dots indicate the length of a pause ..... although not in any terribly structured way .. just in a sort of "this is roughly how long the pause was compared to other pauses" kind of way. I do not have a particular reason why yet but words tumbling out quickly and ones voiced hesitantly are interesting to me.

Fast and slow.

And then I print the transcripts and I read them again, and again. And I write over them again, and again and in amongst all of that some sort of form develops and what I feel compelled to communicate and how it seems right to say it ... happens.

Each time I return to my data I notice I am little more distanced from it. Reading transcripts is so much less personal than listening to interviews which is so much less personal than conducting interviews. Once captured on the page all interview data is more equal, flatter. Re-listening to my recordings and reading my transcripts at the same time, breathes the peaks and troughs back into my one-dimensional scripts and has become another important aspect of analysis, helping me to identify what I would like to perpetuate. And then a final step in re-presentation and one I had not thought about until the time came. Reproducing the transcripts for you in a digestible form involves a few more tweaks and a new symbol ____ has crept into my vocabulary. It lets you know there are some missing words; ones I judge as being superfluous to the story I want to tell.

Although I can trace thoughts of Braun and Clarke (2006) on thematic analysis in what I am doing, their prescriptions are not replicated. More, I am learning how to research *what* I want, *how* I want, by doing it. I think an aspect of my *how* is about listening differently, listening with peripheral version, without getting caught up in the traffic. Now I am establishing my *how*, I think I might be a little better at interviewing.

Talking with Holly

Holly faced a challenge in her second PGCE placement school. A published mathematics scheme was used and lessons followed a pattern: step-by-step teacher explanation "that's the way to do it", followed by children replicating what had been shown, largely in silence. Over the course of our mathematics specialist sessions Holly, identified an interest in children's mathematical talk but found it difficult to create a culture of learning where children discussed mathematics and reasoned aloud together in this particular classroom. When Holly did try to incorporate elements of discussion into her lesson, she found children did not talk as productively as she had hoped and she received feedback from her mentors that learning time was wasted. As a teacher in the very early stages of her career Holly had little experience to draw on to begin to shape or scaffold an environment where children could discuss their mathematical thinking more productively so, on the whole, she stuck to the school's agreed format of how to teach mathematics lessons, even though this jarred to some extent with her beliefs about learning and teaching.

This kind of grin, bear and get through it strategy is one I encounter every now and then. Often postgraduate teachers in such a situation have the foresight to know they will need to manage this, perhaps otherwise unsustainable, position for a relatively short period of time. They keep their eyes on the prize knowing they will soon have their own class, where they can work in the ways they wish and establish a culture of learning that feels right to them (think of Laura and her seating arrangements and her planning fish). Sure enough, towards the end of her PGCE year, Holly secured a teaching post in the city where she had completed her undergraduate degree and, still interested in promoting children's mathematical talk, she highlighted this as a focus for further development in her Transition Training Plan. However, on arriving home after our third interview, the first with Holly after beginning her exciting newly qualified teaching post, the one full of possibility and reward for qualifying, I wrote:

> Blimey! This has to be a pretty bad case of how to encourage primary maths specialists into the profession. It was hard in the interview not to be negative about the school. I tried to keep focused on what was happening rather than making judgements but I will be interested to listen back and see how I managed this (or not). My impression is Holly wanted to engage in this process partly as a form of support – she wanted some advice and guidance on how to continue. This placed me in a slightly different role – one I hadn't been expecting – a cross over between researcher and tutor that had not been so evident in other interviews. Some similarities were evident - around establishing systems and processes – so much to do with a focus on measuring what children can and can't do and so little on learning and teaching maths. Holly's focus on culture of the classroom and culture of learning maths came across for me – and this was recognised by SLT – but the focus on outcomes and evidence in books does not seem to help establish the culture. I can't believe they wouldn't let her have her maths specialism target – outrageous. The whole idea she has something to offer is not being recognised at this stage. No training! No interest in her specialism! PE! This raises questions about the value of NQT's and beliefs about what they are capable of / useful for in the education machine. She has asked for opportunities to learn and be involved and they have knocked her back. Her voice is not at all heard. A belief that she has something to offer is not there. (Me, Digital Diary, December 2016)

It seemed a culture of survival reigned in the school and Holly was advised to just get through her newly qualified teaching year without adding anything else to her plate. Fortunately Holly was able to appreciate this as an act of kindness on the behalf of her superiors, although she did express feeling slightly befuddled as to why her enthusiasm for further training and offers to be more involved in the mathematical thread of school life would be declined for this reason, when further involvement with Physical Education was encouraged. To compound matters, the school had an Ofsted inspection soon after she had begun her post and it had not gone well: experts were installed, practice across the school was constantly scrutinised and staff morale was low. This was a far cry from the imagined newly qualified teaching year, the one promised after a PGCE year, where a teacher is

recognised as a qualified professional with some degree of autonomy and choice about the culture of learning and teaching in their classroom.

Given this turn of events perhaps I should not have continued interviewing Holly?

Possibly because I was focused on what I needed for my research this thought, I am embarrassed to say, did not occur to me at the time.

I arranged to meet Holly three times over her newly qualified teaching year, during school holidays in various coffee shops (hence Ella Fitzgerald singing Christmas songs), of a city with a mutually convenient location. The interviews track a change from a person full of excitement about their blossoming career to one betraying a hint of guarded cynicism to one in despair. Methodological talk of transcripts being a mere representation of an interview rings in my ears: listening back to the sequence of Holly's interviews is upsetting while reading the transcripts is not. I am not sure if transcripts can capture hopelessness.

At many points the interviews do not sound like interviews but more like out of context tutorials. How seriously Holly took her role as a teacher was clear throughout them and she constantly questioned her practice. She was open to receiving guidance and desperately wanted to achieve her often-expressed aim of learning to teach mathematics well and I, rather unwittingly, found myself thrust into the role of being a person who might be able to help. I hear myself trying to offer words of encouragement but they sound a little too jolly, a little platitudy, because I do not know what to say and nothing I do say will make it better. I ask dull questions about planning lessons and making worksheets; they at once keep us on safe ground and lead us down blind alleys. While it had been important for Izzy to drop the tutor/tutee relationship as soon as possible and for Laura to show me how well she was doing at establishing herself as a primary mathematics specialist, Holly wanted advice. She would sometimes ask me direct questions and I felt wrong-footed when she posed them:

Do you think there is a cultural element to the Shanghai approach that is not transferable to the U.K.?

How do you help low achieving children explain their mathematical reasoning?

What are the things children *really* struggle with?

Did you find children understood maths better if you made it more practical?

Is there value to posing a random maths question every morning?

I did not like having my role flipped from interrogator to interrogated and wanted to say: I am the interviewer, I am the one asking questions, I do not want to be your tutor today

I am a researcher.

I tended to sidestep her questions and every now and then I think I sensed her frustration at not getting a direct answer. I feared I would be violating an interviewing code and breaking the rules of social research by entering into tutor territory: offering something I should not be, crossing a boundary and encouraging inappropriate dependence. I hope I am not hiding behind ethical concerns here because I am also aware of a slightly less comfortable truth: I felt ill equipped to respond to Holly's questions and her plight. I did not have good answers. It did not seem acceptable to say "I don't actually know; I am still grappling with the complexity of teaching fundamental mathematical concepts and navigating the education system at large and I am twenty-seven years into my career". Such a response would be an unhelpful truth and also expose me as a fraud.

This is not what I thought I would be getting into when I signed up for a PhD.

With Holly I found myself caught in limbo. If I was not colleague, not tutor, not researcher what was I? Again the notion of travelling with participants in this type of study comes to mind. While, way back at the start of my journey, I had wanted to write myself into this role, when actually called upon to travel I found myself lacking; things became messy and unproductive as our baggage weighed heavily.

In sticking together I think we did gradually develop a helpful way of listening and talking. I hope we established a reciprocal checking in tone in the interviews, coming some way to the relational way of knowing Clandinin and Connelly (1996) speak of. I wonder though, is it advisable to research the experiences of people you have a pre-existing relationship with? Perhaps strangers are safer.

Holly.

Holly, Holly, Holly.

Something in the plot is niggling me.

There is an idea about learning and teaching mathematics Holly holds dear. She spoke of it confidently and clearly in her Expression of Interest, when learning to be a teacher was going to unfold along a neat trajectory:

> I strongly believe maths is a discipline in which all can excel as most maths problems can be broken down into manageable addition, subtraction, division or multiplication sub-questions then pieced together in a logical fashion - it is just a case of trusting the process and making a start (Holly, Expression of Interest, February 2016)

The notion of breaking mathematics down into steps was deep at the heart of Holly's ideas about how mathematical concepts are learnt and taught/taught and learnt. Even though the viability of this construct soon began to fray, Holly held onto it, talking about her experiences of trying to break mathematics down throughout the first interview and the last:

I was trying to get across the idea that there might be correct steps

But I'm unsure how to convey it really clearly

I'm not good at breaking the little steps down yet

I just don't step them through the questions well enough

And help them break it down

(Holly, Interview 1, March 2016)

What I've found hard is

To break it down into those steps

I'll just notice the disparity between what I thought were the steps in my head

And then the sheets I've produced

And then found "oh, it's not quite matched"

I'm trying to teach it really carefully

Step by step

And there are sub-steps you think they've got from previous lessons

But they haven't

(Holly, Interview 5, August 2017)

In the first interview:

Me: have you an example in mind of what breaking it down might look like?

Holly: …I really struggled with fractions . having looked at the national curriculum . they should have known what a half, a quarter and a third were and how to colour them in so we started by talking about it with some visuals and then I said, "right can you colour in half of these shapes" and they had a square cut into two and they all coloured in a half and that was fine . and a square cut into four and they all coloured in one . and for the life of me I just couldn't work out to show them that that wasn't half ____ and I couldn't . couldn't conceive in my mind how that would be a problem that children would have _____ so I got the fraction wall out and I just couldn't see . or even understand how that would be . an issue . but I think it's areas like that where I want someone to be . what are the real . what is it that children really struggle with and why is that and what have I taken for granted that I've just understood

(Holly, Interview 1, March 2016)

And in the last:

Me: so when you sort of realise your explanation of the concept somehow is not . quite addressing where they are _____ have you got an example?

Holly: …we did angles, and you teach them the rules for angles so "this is an acute and this is a right angle, this is an obtuse" and you get them to show you with their arms and then you know you do all of that and you think "oh this is working really well" and then … you get them all to do the little starter sheet where it's just got the angles and they all get that right and then you give it to them in a shape and it's like you haven't taught them anything . I mean everybody got it wrong . I think it's just . you know . it's a missed . I just missed where the . how that happened . do you know what I mean . I've just

> got no idea how thirty children couldn't see that .. but obviously it's something I've missed . if none of them can do it that's definitely a "me" error … I think . I find that really interesting . to find . I don't know quite what happened there (Holly, Interview 5, August 2017)

I am interested in stories telling of breaking big mathematical ideas down into bite-sized digestible pieces because this feels like an approach to learning and teaching mathematics indicating a belief that mathematics is a set of skills. It is a view I often come across when listening to teachers, new and old, talk about their experiences of grappling with the learning and teaching of primary mathematics and when reading schemes of work and textbooks and teachers' plans and observing lessons and listening to teachers' explanations:

this is one of these

and this is one of these

now let's put them together

and

watch my lesson fall apart

Holly captures this piecemeal approach perfectly in her talk of her experiences. She also captures the frustration and incredulousness of a person who cares deeply about teaching children well and helping them learn well, but despite their very, very best efforts, never quite hits the sweet spot. What began as an approach to teaching mathematics took on something of a moral imperative for Holly and she developed a more complete narrative along the lines of:

> In order to enable children to learn mathematics I must break the mathematics down into small manageable steps. This will be helpful for children because it will reduce their anxieties about the subject and so help them enjoy doing it. If I can break the mathematics down successfully not only will they enjoy the subject but they will also be successful at it. Being successful at mathematics is important throughout a person's entire life. And, as everybody knows, successful students are the surest indicators of effective teachers.

When Holly's "break it down" strategies did not enable the children to be successful the only conclusion she could come to was that she was not breaking down the mathematics correctly and so, twice fold, was not a good teacher. Colleagues who were unsupportive when she tried different approaches and inspectors who made harsh judgements further compounded the idea Holly was failing in some way. The master narrative of deficit was supported from all angles and a tragic plotline woven.

Rewind.

In my mind's eye it is an evening some sixteen (sixteen?!) years ago and I am in a classroom at the University of Bristol with a small group of other Master's degree students, all slightly weary after a day of teaching. We each have an A4-sized brown envelope containing readings particular to our interests, offered by Laurinda, also present. I am wrestling with Skemp (1976)

Me: so relational is the good one and instrumental is the bad one?

Laurinda: it's perhaps not so much that one is good and one is bad

Holly's "break it down into the smallest steps" resonates with Skemp's (1976) idea of instrumental understanding. Skemp describes relational understanding as 'knowing both what to do and why' but instrumental understanding as 'rules without reasons' (p.20). In

breaking mathematical processes down into small steps it is possible for mathematical activity to become a question of following a series of set rules: first do this, then this and finally that, and the correct answer will pop out (as long as all of the steps are remembered in the correct order and performed accurately). Skemp (1976) acknowledges such processes have their benefits but points out, with such an approach, the connected quality of mathematical ideas can be missed, making it an inefficient way of learning. One interpretation of Holly's approach to teaching mathematics could be that she had an instrumental understanding, a procedural, 'plug away' connection with the subject (Watson, 2016, p.14). If a teacher understands mathematics purely as a series of instrumental steps, it stands to reason it would be impossible for them to offer their children a more relational engagement. However, Holly also talked about making connections and links, and expressed an awareness of the potential limitations in teaching rules without reason, indicating a more complex connection with the subject:

> Holly: there were elements when I thought "I bet we could have gone deeper or made more links" so for example when I taught ratio, in the back of mind I thought "I could link this to fractions" but I didn't and I wish I had, but I didn't because I was like "oh no that will get a bit complicated and I might not be able to deal with that" but I knew there was a link but I didn't explore it with the children ____ I think when you get into the classroom it feels harder to actually do .. as I reflect on what I have done I can see how I could have gone deeper but when I'm planning it and I'm trying to think what does this really look like to understand this or how can children be flexible . I think I sometimes felt I was trying to push children to put the ideas into different contexts . I feel that there was a bit of tension there between . how much do you just really give them a chance to say . what does ratio look like in all these different scenarios and then there's an element of . they do need a bit of

practice first before they can do that .. so I don't know whether I felt that tension more than there really was or I just worried that it was there or whether there was the idea that . "oh you could give them a bit more chance to practice because problem solving is on Fridays so we'll wait 'til then" when that wasn't necessarily the way I wanted to address it

Me: so there's a belief there that we learn the skills first and then once we've got the skills we can apply that to a broader situation and you're . I think you're saying perhaps we could look in a more open way initially . we could turn that around if we wanted to?

Holly: yes but then that also felt like I didn't know how to do that in a really successful way so then would just revert to well . I'll just teach them that way but I didn't want to just teach them "oh you just times the top part and the bottom by the same thing" I didn't want to teach them that

Me: Why not?

Holly: because I wanted them to see what it looked like because otherwise they'll be timesing them all the time and won't understand when it's appropriate . I think we were simplifying fractions and being able to visualise in your mind what it looks like is really helpful because otherwise . whatever you do to the bottom you do to the top . when we add it or when we divide . I don't know I just felt like .. I couldn't come up with a really clear definition or explanation for that phrase of "what we do to the bottom we do to the top" so I didn't want to use it . I wanted them to see it first and some of the children in the group did see the pattern and they were "ohhh . it's increasing by the same amount" and then I said "oh yes . that's why some people would say . what we do to the bottom we do to the top" so I did it with those but it was

from a position when they had already noticed that pattern but I couldn't get everyone to notice it

(Holly, Interview 1, March 2016)

Skemp (1976) suggests one of the reasons for teachers taking an instrumental approach is it is easier to teach this way and this is implied in Holly's telling. However, the reason for choosing the easier option is not because it is easy but because Holly does not yet have an alternative: she is aware there are links and wants to make these links but just does not know how to. As I sit with her descriptions, I notice how much is stacked against her being able to teach to make links.

Firstly the curriculum itself is organised into bite-sized chunks:

they should have known what a half, a quarter and a third were and how to colour them in.

Then there is pressure on Holly to teach well and this limits the risks she feels she can take. Even though she knows things are not quite right, she is caught in a bind of having to do what she inherently knows is not quite right because this is safer, and probably more productive, in the short term anyway, than trying something different:

"oh no that will get a bit complicated and I might not be able to deal with that"; I didn't know how to do that in a really successful way.

There also seems to be an unquestioned consensus about the order in which learning is meant to happen:

they need a bit of practice first . before they can do that . and "problem solving is on Fridays so we'll wait 'til then".

Finally, this extract captures some thoughts about the difficulties of keeping a class together and moving in the same learning direction en masse:

> I wanted them to see it first and some of the children did see the pattern but I couldn't get everyone to notice it.

I appreciate I have perhaps just exemplified Skemp's (1976) ideas here but I want to stress: breaking down the mathematics into bite-sized chunks is not about Holly taking an easy option.

As well as Skemp (1976), another text from my Master's degree was alive in my mind while I listened to Holly talking about breaking mathematics down into the smallest steps. Like Holly I too have a quest to become a good teacher of mathematics and over time I have read and re-read the aptly titled *Effective Teachers of Numeracy* by Askew, Rhodes, M. Brown, Wiliam and Johnson (1997). I have poured over this text seeking the answers it promises to hold:

> tell me what should I do in my classroom in order to become a truly effective practitioner rather than a mediocre or, god forbid, an ineffective one.

Many of the insights given in the document, a study of a range of evidence gathered from ninety primary teachers on the ways in which they conceptualised the learning and teaching of mathematics, have stayed with me and one of them is about "breaking the maths down". The researchers observed some teachers presenting mathematics to children in 'small, fragmented steps' (p.40). When asked about their actions, the teachers explained they needed to simplify the mathematics because it was too hard for their children to do otherwise. The researchers found while this approach helped children to be successful in the short term, because they only ever had to answer small, simplified questions, the approach cultivated a reliance of the children on the teacher to do the breaking down for them and also resulted in them not making connections between the small fragments.

As Holly explained her endeavours to break aspects of mathematical knowledge and understanding into small steps in order to help her children access bigger, more complex ideas in time, part of me wanted to tell Holly about Skemp's instrumental understanding and Askew et. al's fragments and my view of her view:

> "look at what these eminent people say about this issue. Unfortunately you are barking up the wrong tree and your whole notion of breaking mathematics down into infinitesimally small steps is both futile and inferior. You have identified the futility yourself: whatever the smallest step you think of is, with this view of learning mathematics, you will always see your children throwing up smaller ones, ones you did not anticipate. Think of bacteria multiplying. Even if somehow you did manage to break the mathematics down into the right steps (which probably do not exist) and design the perfect set of worksheets for children to rehearse each step (many publishing companies have already tried to do this) you would never be able to build it back up into some coherent whole again because mathematics, and learning in general, does not actually happen like this, however tempting it might be to look back on our own tidy narratives of development and think it does. When you have finished reading Skemp and Askew et. al. you also ought to read Gregory Bateson and his chapter called *Culture Contact and Schismogenesis* in *Steps to an Ecology of Mind* which is essentially about the foolishness of trying to chop things up into neat, tidy pieces and label them all. Look. It is like this: you just cannot protect people from the complexity of apparently simple fundamental mathematical concepts. Moreover, if you attempt to do so you will not actually be allowing your children to engage in mathematics; you will be asking them to do something else and although I am not sure what to call that something else, at best it is a waste of time and effort and at worst it may

> well render anyone you teach incapable of doing actual mathematics in the future"

but I did not:

> this book on misconceptions is quite a nice one . children's errors in mathematics .. it goes into . areas of the curriculum . what might be the common misconceptions (oh, ok) so rather than having to find them out for yourself (yes) in the moment [laughter] there is a bit of pre-warning (ok) I think your core PGCE textbook does that a bit as well (yes . no . yes) but you're never going to anticipate everything (that's true) … so did you find a good model that showed a half can represented in lots of different ways? (Holly, Interview 1, March 2016)

Since this interview I have thought about what I might have said if Holly and I were colleagues in the same school and teaching parallel classes. Imagine: we have both been involved in planning and teaching the same lesson on finding a half, a quarter and a third of a shape and we have both witnessed a state of confusion amongst our children and experienced getting tied into knots over how to try and rectify the situation. We are now sitting together to plan the next lesson. What would I have offered in this scenario? Or if she had come to me with her story of shading halves in one of our mathematics sessions at university, when I was in mathematics teacher educator mode? I would like to think if I had been Holly's partner teacher and so on a more equal footing or in mathematics teacher educator mode with thoughts of classroom practice at the forefront of my mind I would have been able to respond more fruitfully but I am not sure I could have.

Here I reach to you, the reader. What would you have done in my position? Would you have challenged the idea of creating carefully dissected sequences of teaching where one step leads smoothly and unproblematically to the next? Questioned those neatly strung beads,

prodded the ducks lined up in an orderly fashion? Possibly you are a person interested in mathematics education and, if so, probably you are familiar with the ease of shading half of an arbitrary diagram (of a cake or pizza perhaps) which has been divided into two (roughly because it has been drawn freehand on the board) equal parts and the enormous complexity of shading half of an approximately congruent (because it has been drawn freehand on the board) arbitrary diagram of a cake or a pizza which has been divided into four (roughly) equal parts. You might even be able to tell your own story of the time this first happened in your classroom and how you work alongside young people learning about parts of wholes now. You might be thinking of what you would have offered Holly in this moment, which readings about teaching and learning mathematics you could put into a brown envelope or the diagram you would have drawn in your notebook and the problem or investigation or question you might have posed for Holly to think about with her children. As well as being interested in what you might have offered Holly I am also interested in how you changed from your "shade half a pizza" offer to the one you would make now. What stimulated that change? What supported you to be able to develop a different offering? Of course this line of wondering assumes you have made a change. Perhaps not. Perhaps this is how learning to shade a half always will be.

In that moment, when called upon to respond, I was a researcher and I wanted to withhold from giving my view. I was cautious of making an offer carrying the judgement that Holly was in some way *wrong* and I was somehow *right*. I did not want to reinforce the deficit view of early career teachers. Through her questions Holly was inviting me to give advice, to help her change but as an interviewer I felt had no role in seeking to change her behaviour but as a mathematics teacher educator? As a colleague with a shared interest in learning to teach mathematics? Again my multiple identities clashed. I stuck to safe ground and made an offer supporting her contention that if we can be aware of mathematical concepts and develop our

subject knowledge around these we may be in a position to cope with them more fruitfully. I pointed her to a book that could help with her plea:

> it's areas like that where I want someone to be . what are the real . what is it that children really struggle with and why is that and what have I taken for granted that I've just understood (Holly, Interview 1, March 2016)

But I fear I too reinforced the deficit position: you do not know enough yet.

Clearly, I have a vested interest in arguing otherwise, but it just does not feel a satisfactory explanation Holly could only engage with the learning and teaching of mathematics in a general or deficit way. Time and time again Holly showed a particular knowledge and awareness of fundamental mathematical concepts and approaches to learning and teaching mathematics demonstrating her interest in the subject:

- a recognition of an over-reliance on counting in ones in order to perform numerical calculations (Interview 3 Line 78);
- an awareness of 15 divided by 3 having limitations as an example to demonstrate a formal written method of short division with (Interview 3 Line 272);
- an expression of frustration on recognising she sometimes had different expectations for the higher attaining children in her class rather than high expectations for all children (Interview 3 line 424);
- a continued interest in designing and offering tasks with the potential to promote discussion and mathematical explanations (Interview 3 Line 546);
- a recognition of mathematical ideas as big and connected (Interview 4 Line 974).

Of course, it is reasonable to expect a teacher will learn and learn and learn over their career and has the potential to become more sophisticated in their work but early career teachers

have classrooms full of pupils in front of them and have to act, now. While Holly knew she needed to do something different there was just not another viable option for her:

I think sometimes

the maths specialism

I felt able to apply for it

because I am good at maths

but

that's not all there is to primary maths teaching

it doesn't mean that I can teach it

so I feel the strain of that

you know

it's just a lot harder to teach maths than I thought it would be.

Fast forward.

In staying with these stories I have come to notice differences as well as similarities. The story of “Shade a Half” concludes with me offering an answer of sorts, but in the story of “Holly’s Angles” our conversation is more exploratory

> Me: so let me make sure I’ve got it . so you’re saying you’d give them a picture like that and they’d say “yes that’s acute” then a picture like that . “yes that’s obtuse”
>
> Holly: I said something like prove to me that you can have a shape with more than one obtuse angle and they said “we understand your question but we don’t know what to do to show you” so I said “what’s your first step going to be?” but they didn’t think then that their first step should probably be to draw an obtuse angle so then I went back to the other teacher and said our problem is that they cannot work systematically ___ I realised then that was the first problem because if you read a question and it says “can you have three obtuse angles in a triangle?” if they’re not thinking well I’ll try and draw one with three obtuse angles and see if I can make a triangle ___ I think I’ve just realised that’s a step that I’ve missed . they don’t know how to work through a question like that so I then had two weeks of lessons and they had to work to work systematically and just try it . draw it . make it out of play dough . I don’t care but just try it
>
> Me: so what is a very natural step for you just wasn’t for them . it reminds me of what you said earlier about how you weren’t taught to reason at all at school but your dad would say “what do you know? . let’s make a start” . it feels a little bit like that
>
> Holly: yes that’s really true . I forgot I had to actually learn those things

Me: that's a nice phrase "I forgot I actually had to learn those things"

Holly: I think because I would say I'm now quite quick ____ if you gave me a problem I'd be quite quick to think of a way to go about it ____ I think because of that I'd forgotten that actually you have to think . I've just . in messing around with maths in my head I've probably come up with loads of different strategies ____ like "I tried that last time" or "somebody showed me that way and that worked so I'll try that again" ... so I'll go back and try those and draw a triangle to begin with and think "oh how can I change some of the sides?" those types of things ____ I think learning to put yourself in the position of the learner is something I've found hard to do . I've also found that I'm not sure other teachers do it and I would have expected to see other teachers to do that better because they've been teaching for longer

Me: but you're not seeing that

Holly: I'm not seeing it influence planning and teaching so they say "oh yes they always struggle on that" and I think "well if you know they always struggle why don't you say so and then we can think it through" I find that frustrating

Me: so do you imagine in your planning meetings being able to say "right what are they going to find hard about this"

Holly: I've started saying that but then I'm not sure they are confident in maths to be able to pick apart what it is they're really struggling with so I'll come back and say "it's this they don't understand"

(Holly, Interview 5, August 2017)

and I notice we have both learnt, both changed over time.

While Holly still wants to step her children through their learning, she is now thinking about steps enabling children to work on *any* mathematical problem. She is working with children to support them in feeling able to have a go and give things a try. She is thinking about the possibilities involved in such a process – perhaps drawing a diagram then drawing another one and noticing similarities and differences. She is offering opportunities for children to prove their thinking. This activity feels like mathematical activity. Holly also trusts herself to make important judgements about children's learning and has the confidence to take the lead in conversations with more experienced colleagues.

I can see myself flexing my narrative interviewing muscles as I invite Holly to give more detail of her experiences by reflecting back words and phrases she uses, gently extending ideas, re-invoking things said previously. Rather than exerting my views, giving answers or making judgements I attempt to make a space where Holly can notice what she is saying and answer her own questions. Perhaps I am travelling rather than mining. Subordinating talking to listening, fast to slow. It is coming more easily now.

It seems the novices have learnt new skills. Some of our old habits of mind have slipped away and been replaced by new patterns of thinking. These are now evident in our work without having to be thought about and are brought into being more readily. In stepping back in time, through listening to Holly's experiences, I am remembering some of the things I forgot I actually had to learn: Skemp's (1976) ideas do not have to be arm wrestled into two dichotomous categories; proportions of a rectangle can be represented in many different ways. In analysing experiences still fresh I can catch hold of what it is to learn. These are subtle stories of change and development.

Talking with Sam

Having worked in detail with Laura's and Holly's interviews, transcripts and documents, I notice I am handling Sam's with greater purpose. Just as I developed my way with interviewing, I am developing my way with taking data and shaping it to tell certain stories. With Laura's data the analytical process felt nebulous, as if the stories arose; I was excited to find them and tell them. With Holly's I had more of a sense of what I wanted to say but had to tussle and tease the stories out. With Sam's I am acting with intention. I know which narrative threads I want to privilege. I am alert to stories Sam tells about learning and teaching mathematics, ones about school systems, or the conduit (Clandinin and Connelly, 1995), and the roles different people play in those systems. I am interested in Sam's interpretation of being a mathematics specialist and any ethical knots in need of easing. Stories lending themselves to exploring the notion of specialist and generalist subject knowledge bases continue to be important as do threads running from the beginning to the end of the data set: stories of persistence as well as those of change. I at once feel relieved to have glimmers of the structure of a system in place but also a little flat: the fire of a new beginning is already confined. Through this more focused layer of analysis I notice, while the interviews felt free flow at the time, the transcripts hold a pattern, not in the use of the same questions in the same order each time but more in the same sort of ground being covered. I now realise this is inevitable because I talk to Laura, Holly and Sam for the same reasons, with the same overarching research questions in mind and wonder why it has taken this long for me to notice repetitions. I also realise the interview as a site of knowledge construction, is a speck in the process of linking ideas together, in words, to create stories, telling of experiences, as if to offer meaning.

In re-listening to our recordings and re-reading my transcripts I am reminded of a particular feature of our interviews together. Sam takes time to think before she speaks and, with her, I learnt to be comfortable with pauses so long they sometimes stretched to silences. My earlier

number crunching speaks something of our slower pace but despite this, or perhaps because of it, our conversations were focused and in our approximately one hundred and forty words per minute we covered a lot of ground. The stories I want to weave and write and tell will communicate the knowledge of Sam's experiences constructed as I have walked and listened and read and annotated and written.

As with Laura and Holly, I often asked Sam to tell me about the mathematics she had been working on recently with her children and, to begin with, I would like to tell you about some of the things she told me. In re-presenting these stories of learning and teaching mathematics I aim to illustrate the types of learning opportunities Sam liked to create for her children and also something of her mathematical knowledge base.

In the first interview, Sam told me about a lesson she felt proud of. Her training mentor had asked her to plan a one-off lesson on equivalent fractions. Sam explained:

> I used loads of visual things to demonstrate how fractions can be written differently but mean the same.

One of the offers she made involved asking the children to think about different ways in which half a Kit Kat could be eaten and she used a number of images to show a Kit Kat broken into different parts to support the discussion. As a whole class, they considered breaking a Kit Kat down the middle and eating one half, or two quarters. They considered eating just one stick or the whole thing. (In case you are unfamiliar, a Kit Kat is a type of confectionery, rectangular in shape and made up of four wafery/chocolaty sticks joined together. Sticks can be snapped off to separate them from others.)

Next, Sam gave each child a piece of paper. She asked them to fold their piece of paper down the middle, open it out, and then shade one half with a colouring pencil. She asked them to

notice that one part out of two parts was shaded. She asked the children to fold the same piece of paper in half again and then in half again. The children noticed:

oh

now it's two out of four

and

now it's four out of eight.

Sam then showed the children some presentation slides with sequences of shaded circles and talked about finding equivalent fractions by doing

the same to the top and the bottom

and gave them some worksheets with

two fractions next to each other with arrows and some missing information.

I asked Sam why she felt proud of this lesson and she talked about the interactive and visual aspects of the lesson and the way the different representations supported her verbal explanations by making them

clear and relatable and helping the bridge between concrete and abstract

understandings.

Sam told me she had spent a long time planning the lesson, until she was literally

dreaming in equivalent fractions.

The preparation helped her feel relaxed and at the end of the lesson when the children were handing in their worksheets she was able to joke around with them and say

there are seven out of twenty eight students out of their seats, what's that as a simplified fraction? (Sam, Interview 1, March 2016)

In the same interview Sam also told me about a lesson which had not gone so well. It was a lesson about factors and multiples and she

got in a complete muddle.

She explained:

I kind of went in thinking … "oh I know this really well so it will be fine" and I had my activities and everything but I suddenly realised this was completely new to them and I needed to be explaining it in a way that was going to stick and it became really difficult (Sam, Interview 1, March 2016)

In spending time preparing her lesson on equivalent fractions, Sam had designed models and images, tasks and explanations, which seemed to support children's learning positively. Her relaxed yet purposeful joking at the end of the lesson indicates a calm confidence in her capacity as a teacher leading learning in a classroom of young people. In contrast, her reflections on her lessons on multiples and factors indicate a recognition that while her own subject knowledge was secure, the teacherly subject knowledge required to communicate apparently straightforward ideas associated with multiplicative reasoning was perhaps not so well established yet. Placing these two stories of teaching mathematics beside each other highlights facets of a particular knowledge. Firstly, Sam recognises apparently simple mathematical ideas are complex ones. Secondly, she recognises there is a difference between knowing something for yourself and knowing how to support others to know. The following learning and teaching vignettes offer further examples:

Sam: most recently we've been doing multiplication ____ I tried to make it more interactive for them so I got them to make up their own ideas for questions

> where they could draw the pictures ____ sort of like “three cakes have two candles each how many all together?” and they had to draw the candles and the cakes and then I taught them how to write the number sentence and then when they’d finished that they could make up their own questions so they had “something has got something each, how many something’s altogether?” ____ they came up with all sorts of different things ____ I was really impressed with Anna because she did “ten girls have ten lollies each” and she’d drawn one lolly each for them but she’d counted in tens . she’d realised that one lolly can represent ten lollies ____ and she’d put ten times ten equals a hundred _____ when I read that I was really excited because quite often I don’t think we make it open ended enough and then they don’t have the chance to ____ take it on further themselves (Sam, Interview 4, May 2017)

Sam’s recognition of the sophistication in Anna’s drawing, where one image represented an amount other than one, has the texture of specialist knowledge to me. Likewise, the offer of a general statement

something has got something each how many somethings altogether?

feels as if Sam gets to an important mathematical nub. Rather than offering more of the same examples where objects and amounts are fixed, albeit with alternative values, Sam makes a move to the general and this move stands out to me. The feeling of excitement Sam communicates in noticing Anna being able to extend her thinking as a result of a more open opportunity again signals specialist awareness to me: Sam recognises the potential in making more open offers and she is alert to subtle shifts in children’s mathematical thinking. Moreover she finds these small and perhaps easily missed mathematical moments exciting.

In the following two conversations there were opportunities for discussion of structures of arithmetic:

Sam: yesterday we did subtraction ___ there were subtraction questions in different contexts _____ balloons popping or ice-creams melting ___ we drew five balloons and then someone came up and popped two and we talked about what it would look like as a number sentence and how when you take away you're getting rid of them so they crossed out two and I tried to make it really obvious what was going on for them ___ and then they did it with people _____ "all these people are going for a swim and these two are cold so they are getting out of the pool" things like that

Me: so the aim was "I can subtract a single digit number from a single digit number" ___ and then by counting back . they were counting back in ones maybe or...?

Sam: say they had five counters which were representing their five balloons we'd say "oh two balloons have popped so we need to take them away" and we'd just get rid of them and count how many were left

(Sam, Interview 3, December 2016)

As Sam told me this brief story of classroom mathematics, I created an image in my mind. I pictured her drawing five balloons on the board then rubbing out the first one as it popped and then the second one as it too popped. I imagined her associated teacher patter emphasising a count back strategy, something like:

"I had five balloons but one popped and now there are four balloons, five balloons take away one balloon leaves four balloons"

and so on, but in response to my prompt Sam's explanation implies the modelling of a count all strategy. While this will result in the correct answer to such a calculation every time it feels as if it might be helpful to explore what a count back compared with a count all

strategy could offer in supporting young children's developing knowledge and understanding of subtraction as take away. Laura's stories of her new understanding of the structures of subtraction and Holly's of breaking the mathematics down ring in my ears. I wonder if Sam's drive to "make it really obvious" could lead to confusion and how I might work with the subtleties of calculating take aways by counting back or counting all with teachers in the future.

Similarly in this scenario:

> Sam: I was told by the maths lead and my partner teacher that we needed to teach them the way that we would say it is . "if we had" . I don't know "two apples . three lots of two apples" you would have to write it in the order of "I've got two . three times" and it had to be that way round and we had to show the arrays the right way round as well and then teach them it could be the other way by turning it ____ but I found that saying "oh I've got two three times" was a bit confusing for them and I've always taught "I've got three groups of two and you can put this symbol to say groups of" which is really child friendly so towards the end I ended up saying it both ways ____ and I showed them how the answer was still the same if it was the other way round ____ it seemed a bit pernickety
>
> Me: and did they say why they wanted it ____ that way?
>
> Sam: I think they wanted everyone to be doing it the same way across the school … and there's been quite a push on using accurate maths vocabulary as well so I think it was "times" instead of "groups of" … I don't know cos it's not wrong to do it the other way either . I don't know who decides on why
>
> (Sam, Interview 4, May 2017)

Like Sam, I had always translated the multiplication symbol into the words “groups of” or “lots of” and manipulated arrays to support the phrase two groups of three or three groups of two to show “how the answer was still the same if it was the other way round”. By coincidence, in a recent discussion with a colleague we worked on thinking of the symbolic expression 2 x 3 as two, three times. Having had the chance to play with reading 2 x 3 in this way, I have since come across situations where this is helpful, particularly in working with decimal numbers where saying “nought point five, three times” rather than “nought point five lots of three” offers a different way of seeing connections in number. I wondered how far Sam and her colleagues had explored this together hence my question. Her response indicated the decision had been made around establishing consistent classroom practices, possibly as a result of what T. Brown and McNamara (2011) might describe as ‘administrative filters’ (p.25), rather than for reasons of supporting conceptual understanding of structures in number.

While there was scope to explore these mathematical details further and although I probed a little more, I did not push. Now was not the time for subject knowledge development and Sam did not call on me to act as coach; our role definitions remained comfortable, clear.

The stories re-presented so far were all connected to specific events but some ran more like plot lines through all of our conversations, from the first to the last. Even though points of tension were evident across Sam’s experience, over the eighteen months or so I spoke to her, her sense of what she wanted to achieve in her mathematics lessons stayed relatively stable. At various times she described what it was she wanted to achieve in her work and this description captures the essence of the learning opportunities she identified as wanting to offer:

> creative accessible maths lessons which aren’t worksheet based . ones that are more open ended (Sam, Interview 2, June 2016)

and Sam felt she was able to achieve this goal to an extent. She put much of her success down to the influence and guidance of her second Training Mentor, Yvette. Sam described Yvette as being creative in her practice, as a teacher who wanted children to learn through play, a teacher who saw her role mainly as a guiding one. With Yvette, Sam was able to work in a way honouring the developments she wanted to make in her own practice. She described mathematics lessons where children rehearsed number bonds to ten by knocking down cups with a ball and totalling their scores; and learnt about measures by baking apple crumble. I asked Sam to tell me more about creative mathematics lessons and Yvette's influence:

> Sam: it means sort of making it physical . making it visual and fun and relevant ____ helping children to enjoy it because it's not just written down ____ they're physically interacting with it ____ even just on more boring questions like one less than or one more than she'd get them ____ using other skills as well . so they'd have a timer for thirty seconds . "how many jumps can you do in thirty seconds? that's your number . now find one more than or one less" . so they'd just be completely engaged because they were having a competition between each other and they were using the timer and . yes . so little things like that that mean that they're completely motivated (Sam, Interview 2, June 2016)

At other times she posed problems she described as having a more open or investigative quality to them:

> so you say something like "half of the fish in the bowl are blue . what could this look like?" and so some of them are doing two fish . one blue one orange . some of them are doing ten and ten

and she adapted her plans according to how the children got on:

> a lot of them didn't understand the question but they picked up on what each other had done and we did a plenary to show good examples and then we did the lesson again . "half of the balls in a box are green…" and everyone got it so some could move on to "a quarter of the flowers in the garden are orange"

and she was comfortable with the struggles that children had because

> it was nice to give everyone the same question and not just tell them how to do something (Sam, Interview 5, August 2017)

Sam also told me about a learning/teaching strategy she used. She liked to pair her children and direct one to be the teacher and the other to be the pupil. The teacher then had to teach the pupil what to do. She used this as a strategy to follow up lessons on methods of calculation, as a way of reinforcing the procedures they had learnt together. She observed:

> actually the person teaching was the one that was learning (Sam, Interview 1, March 2016)

Although Sam wanted to inject a sense of fun into her lessons her descriptions of her work indicate doing mathematics and being mathematical was not sacrificed at the expense of the fun. To me this feels like a subtle awareness, an awareness different to a general one, and while Sam recognised Yvette as having a strong influence on her practice

> it's gone really well mostly because of Yvette and her amazing creative ideas
>
> I think Yvette was my biggest influence
>
> (Sam, Interview 4, May 2017)

I can also see the view of learning and teaching mathematics Sam captured in her Expression of Interest, before her PGCE course began, echoing through these stories of her classroom.

Sam works to encourage a love of mathematics and solving problems; she sees the role of the teacher as challenge provider and also confidence builder; she makes use of concrete materials to support conceptual understanding in an interactive, positive learning environment and these foundations were laid in life before Yvette.

I wondered about the place of our specialism sessions. Was there any evidence of anything we had done at university having an influence on her practice? In her Expression of Interest Sam talked about the influence of a reading from her undergraduate degree on her thinking and she continued to reference literature, introduced throughout the university aspect of her training, in her talk of her experiences. Skemp's (1976) discussion of instrumental and relational understanding offered an interpretive frame when she recognised a tension in the thinking behind her lessons compared to that of some of the teachers she worked alongside. While Sam wanted to incorporate explanations and activities with the potential to promote relational understanding, she observed other teachers were not

> as fussed about the children knowing why they are doing something (Sam, Interview 1, March 2016)

She gave this example:

> I was being taught the procedure I would then teach the children and how you had to move to the next column and I was thinking about why that was and how you'd finish doing the units and you were moving to the tens ___ and I was talking about "should I explain this to the children . find a simple way of saying why I'm doing this?" and the teacher was sort of saying "oh that's over complicating it" and "you're overestimating what they'll be interested in knowing" but actually when I did teach that lesson ___ I think I slipped it in ___ I'd just say "what is this two? don't forget . what actually is this two?" and they'd be like "oh it's two hundred" or that sort of thing . just to remind them

> every now and again ____ just making sure place value understanding was there (Sam, Interview 1, March 2016)

Other readings she recalled were from the journal Mathematics Teaching, ones written by teachers about the things they do in their classrooms, and she had plans to read a book by Jo Boaler, having enjoyed a chapter offered from the text (Boaler, 2015). As well as readings, Sam recalled a video we watched of a teacher using Cuisenaire rods with her class, observing:

> just that simple resource and maybe one prompting question . or a true or false statement ____ could lead to so much exploration (Sam, Interview 1, March 2016)

With the aims of PGCE mathematics specialism routes outlined in policy guidance (AMET and NCETM, 2014) in mind I wondered if Sam saw any of her practices as being connected to being a mathematics specialist occasionally asking questions along the lines of:

> so ummm being a primary maths specialist or a person on a primary maths specialist route does that, how's that element for you? When you've been in school and teaching have you felt like a person with a primary maths specialism?

She told me how she had made some suggestions at staff meetings to do with how the teaching team could alter the daily timetable so a focus on mathematics could be sustained and she took responsibility for planning mathematics lessons while her partner teacher took English. Her examples suggest a primary specialist would be a person who brought something new, a person who made change:

> I guess the influence I've had is that I've slowly . gently tried to change the planning ____ so I want to use more mixed ability pairs and more hands-on

> activities ___ it does feel like I've had a little bit of impact on getting things to be more hands on (Sam, Interview 3, December 2016)

> sometimes we use misconception maths monkey in the plenary time and he'll have a speech bubble and an opinion and we have to say if we agree with it or not ____ I suppose I have brought a few things in . the maths monkey . that was an idea from Yvette (Sam, Interview 4, May 2017)

and she had some ideas about what she could offer in the future:

> if there was something . I don't know we did have a maths and art week which I was really interested in because I love maths and art so if anything like that came up I'd probably put myself forward (Sam, Interview 4, May 2017)

However, mostly she explained how she thought she was not a specialist:

> I don't … feel like I've been particularly a maths specialist at my school but maybe it would have been different if Yvette wasn't doing those things and then I'd been bringing them in (Sam, Interview 2, June 2016)

> I haven't flown in as an expert or anything (Sam, Interview 3, December 2016)

and how she had been put off subject leadership:

> in terms of .. being maths lead ___ I feel like I've actually been put off that a bit . seeing the maths lead . Amy . and how hard she works and how knowledgeable she is___ she's a year six teacher as well so she just is always working . and she's done so much for them with their making the calculation policy and medium term plans and everything like that and then she's got this constant … change she's up against as well so sometimes she'll spend days doing something and then have to do something else and it's just put me off a

> bit and ____ I wouldn't know where to start anyway and maybe it's because I'm in my first year but this is enough right now and I'm not even considering that at the moment (Sam, Interview 3, December 2016)
>
> maybe one day ____ Amy was just so good that I would never want to try and measure up but also she's leaving but I didn't feel I could say anything because .. the Ofsted report was really damning to subject leaders who weren't trained in their subject enough ____ I don't know I just felt going into second year wasn't the right time to say anything because I felt like I've only just found my own feet even though I have the specialist course I guess yes I do have that training but I wouldn't have felt ready with the pressure that the school's under to pipe up and suggest I went for that because . yes . it just seems too much (Sam, Interview 5, August 2017)

Within this tangle of policy and practice and personal viewpoints Sam kept working to establish an approach to teaching mathematics in a way which honoured her beliefs and met the learning needs of her children and followed the school's many directions of change. An aspect of practice Sam mentioned a number of times, a fine but defined thread woven throughout her talk, was to do with achieving a balance between the level of challenge and support offered in learning opportunities. Sam saw challenge as an inherent part of mathematics and recognised

> enjoyment of the struggle to solve problems
>
> (Sam, Expression of Interest, February 2016)

as fundamental to engaging in mathematical activity but in trying to develop the level of challenge in her lessons she found herself in a conflicted position. The senior leadership team in her school had decided teachers needed to set more challenging work for the children to

do and this message was reinforced by inspectors during a recent Ofsted inspection. While Sam wanted her classroom to be a place where children puzzled and talked about their reasoning and persevered as a routine part of learning, she noticed her children struggling with this way of being. She explained:

I think we fall into making it quite straightforward for them sometimes

not challenging enough

but

they won't try if it's not clear what to do

(Sam, Interview 4, May 2017)

Sam also recognised messages from parents and their beliefs about being successful in mathematics as having an impact on this aspect of learning and teaching:

> a lot of parents are getting them to recite their times tables and things like that ____ and they do their homework for them because they just want it to look right ____ it's a perfectionist thing ____ it's interesting ____ it feels a bit counter intuitive somehow . they are trying to help but it's actually stopping the learning (Sam, Interview 4, May 2017)

Standing back to take a wide view of this collection of stories standing to communicate something of Sam's experiences, I notice the constant pushes and pulls between how she felt she should be approaching the learning and teaching of mathematics and the way she would like to if she could. Achieving a point of balance between the requirements of her colleagues, her children, the parents of her children and those promulgated in educational policy, while honouring her own beliefs, was difficult. The tension between should, would and could came through particularly strongly in the third and fourth interviews, those made towards the beginning and middle of Sam's newly qualified teaching year:

you're always sort of umm governed by your values ____ it always comes back to what you find most important . and then you try something and you think "oh actually I don't think I agree with this" . you sort of have to change it back or you can't rest ____ I guess that's why I've tried to change a few things here already . because I haven't felt comfortable doing it that way . it's a tricky thing when you're working with different people that all have different ways of looking at it (Interview 3)

we had an INSET day a few weeks ago and everyone left the day feeling like "yes! we really want to do this" but then everyone was sort of like "but we can't . not with the current expectations of the things we do have to do . it doesn't fit" (Interview 3)

I was just feeling really frustrated that the lessons I was teaching felt a bit pointless (Interview 3)

your creativity gets a bit stifled because you have to tick these boxes "this is what we have to get through this week" (Interview 4)

I looked back at the earlier interviews I made with Sam and I noticed a similar tension, as if she was grappling to get hold of a particular way of teaching mathematics which was just out of her reach, and felt what I am coming to recognise as my researcher's ethical conscience pricking. As I scrutinised my recordings and transcripts, I detected something about pushing my notion of mathematics onto Sam and her not knowing what to do because it was my way and not her way:

> I'm still working on finding ways of approaching activities in a more open way ____ sort of investigative "I'm not going to tell you what you'll find out" kind of approach ____ my mind does go blank when I sit there and try and think about

> how to do something like that . I just don't know (Sam, Interview 1, March 2016)

> in terms of my beliefs I've felt a bit like "argh I'm always giving them worksheets" but that's just what the school does and they're year five and maybe this is what I should be doing ___ but yes the content just setting them off on worksheets felt a bit like "oh am I doing enough here . what else could I do?" but not knowing what else to do so just doing that (Sam, Interview 1, March 2016)

> I think what I haven't done is any sort of investigations where they're just set up to try and find something out themselves and I tried it once and it didn't go very well (Sam, Interview 2, June 2016)

Just as Sam was receiving the messages there were *right* ways to teach mathematics from her colleagues at school, I too had been pushing an ideal at university, a notion there is a *right* way, a *best* way of teaching mathematics. As I re-listened to her talk about trying to use different approaches, I recognised the fact that I do promote the use of open and investigative opportunities to support children in their learning of mathematics. I think I have a sound rationale for this: I tend to see the use of structured worksheets designed to practise a previously modelled skill in mathematics lessons at primary schools so I am keen to raise postgraduate teachers' awareness of different approaches; I think it is harder to teach using more open approaches so I want to encourage them to have a go while they have training mentors and academic tutors around them and so are perhaps in a more secure position to make different mathematical offers. Also, the reading I have done and the training I have attended over time, supports the inclusion of a range of approaches, such as the use of investigations and open-ended problems, in the learning and teaching of mathematics. What I had not considered was in highlighting and promoting the use of such approaches and

then asking Sam about her experiences of being a primary mathematics specialist, I was to some degree cornering her into a position of trying to articulate what she thought I thought a primary mathematics specialist is and does, and to describe the way in which she thought she should be approaching the learning and teaching of mathematics according to my view.

And I realise I am part of the conduit.

Fortunately there was some resonance between Sam's way, as outlined in her Expression of Interest, and my way, as communicated through the readings and videos and tasks I offered and, most importantly of all, in Yvette's way as practised in the classroom:

> it's all tied in together but .. yes ____ with Yvette that was where I was applying it and where it sort of sank in I guess so .. she allowed me to do that or showed me how I could do that (Sam, Interview 3, December 2016)

This resonance was important because it meant Sam was able to find a way to move forward, rather than remain stuck, and find a blend between her preferred ways of teaching children mathematics and those of the people around her. It feels important to note that until Sam was in actual teaching situations with actual children to plan lessons for and actual tasks to carry out, the facets of her mathematical subject knowledge from her previous experiences and from the university aspect of her PGCE could only hold limited meaning.

For the fifth and final interview, I met Sam in the summer holidays between her completed newly qualified teaching year and about-to-begin second year as a primary classroom teacher. We sat and talked in her new classroom, surrounded by piled up furniture, heaps of books and teaching materials, and rolls of colourful backing paper, all in the process of being carefully organised and made ready for her next class of children. Some of the tensions she had mentioned over her newly qualified teaching year felt more resolved:

I struggled a bit last year with feeling I had to do it how it was done ___ my partner teacher had been teaching for twenty years and I was an NQT . there were a lot of sheets and ___ they always had to be filled out ___ it's not that it's wrong but it's just having a different perspective (Sam Interview 5)

I think I went to my placement with Yvette ___ and was like "I love this . this works amazingly" but it works amazingly in that setting and there's no way with some of my children that I would have been able to just ___ get on with games to learn from ___ I couldn't have done it that way . so I think I slowly tried to feed in more fun things ___ and then I had to ___ really focus on their building their independence (Sam Interview 5)

next year ___ we're going to have maths jottings books and also thinking books ___ there will be more open-ended mathsy questions as well in morning challenges ___ an emphasis on them not finding it easy ___ knowing that that's a good thing that it's challenging them and getting them to try ___ so I think that will be really positive to use in lessons with sort of more open-ended activities . I don't know . I don't know how that's going to go (Sam Interview 5)

I guess I've always had a vision of how ___ I would like to do things but ___ I've just not known quite . I've known what I wanted to do but not how . maybe and so I've been dabbling rather than fully going for it and I am definitely feeling like ___ I'm slowly becoming more able to shift it (Sam Interview 5)

The benefit of hindsight is a wonderful thing and as I read these snippets from my transcripts now, I recognise my PhD mantra:

research what you want, how you want

and wish I had said:

teach your children what you want, how you want.

Part Three

Inward, outward, backward, forward

Stengers (2018), moved by the writings of Virginia Woolf, implores researchers to 'ask themselves over and over, everywhere and always: what is this civilisation in which we find ourselves?' (p.33). In similar vein, Clandinin (2007) declares: 'narrative researchers must communicate important, binding ideas and insights about what it all meant to them, what they learned and what this might mean to others' (p.595). And I find myself wondering, deeply and unsettlingly, daily: as a result of this study, this talking and listening, this reading and writing and tossing and turning, what is the civilisation in which I now find myself? What ideas and insights might I possibly offer?

Clandinin and Connelly (2000) recognise inward, outward, backward and forward movements on a three-dimensional narrative inquiry space where one axis pivots on personal and social interactions, one on the continuity of experience, and the third on situation. One of the possibilities narrative inquiry offers is to stay with the individual, the unique person (Clandinin and Murphy, 2007), and in exploring the stories of Laura, Holly and Sam separately, I learnt something of their unique experiences and the issues they faced on Clandinin and Connelly's (2000) three dimensions, in their individual contexts. However, one of the main drivers behind me setting out on this venture was the possibility of gaining insight into ways in which I might prepare and support early career primary specialist teachers I might work with in the future in the pursuit of their mathematical interests. My research design and questions therefore have a generalisable tenet at their heart: I can learn something from talking with Laura, Holly and Sam, from studying the *what* and the *how* of our interviews/conversations, and apply my learning to new situations as I move forward on the landscape of mathematics education, steadily making changes (hopefully for the better)

to my practice. In addition, I hoped I might make a contribution to the field of knowledge concerned with teacher development more widely, daring to suppose the conclusions I found significant for my own practice might resonate with others and, possibly, serve to question models of teacher development presuming a simple linear progression from novice to expert. For such contributions to be realised, an outward movement on the landscape of mathematics education is, therefore, also implied.

I am a little hesitant in making such forward and outward moves, in crossing a border to the generalisable. Mertens (2015) summarises generalisability, or external validity, as 'the extent to which findings in one study can be applied to another situation' (p.134) and this expectation of research, if couched in quantitative terms, is problematic in a study of three people (four including me) and their partial recollections of experience and lived meanderings in specific contexts. However, Clandinin and Rosiek (2007) argue narrative inquiry meets the borders of a number of different philosophical standpoints noting realist, modernist, post-modern, constructionist and pragmatic positions. Also, Mertens (2015) describes transferability and thick description, terms associated with qualitative research, as parallels to quantitative notions of generalisability. For her, transferability places an expectation on the reader to make judgements about the suitability of the application of what is presented while that of thick description places weight on the shoulders of the researcher to present a level of detail enabling the reader to make sound judgements. From these standpoints there comes the possibility of making tentative forward and outward moves. To support some mindfully tentative conclusions (Clandinin and Rosiek, 2007), or 'binding ideas' Clandinin (2007, p.595), I bring some of the stories of experience offered in Part Two side-by-side (M. C. Bateson, 1994) and highlight connections (G. Bateson, 1985) across them.

Pauses and Pausing

Earlier I presented the case being and knowing slowly were important ontological and epistemological aspects of my study and, in this corner of civilisation, pauses have been significant. First came a desire to pause time, to slow it down and stretch it out, in order that I might step into Paula's flown by early career period, a time she could now only capture in a handful of words, a smattering of seconds. In pausing alongside Laura, Holly and Sam during the time frame of their early career period as it unfolded, I hoped I might learn along the way and emerge better placed to function fruitfully as a mathematics teacher educator, particularly in my work with postgraduate primary mathematics specialists.

Paula described her first year of teaching as a time of "acting on instinct". She marked this time as significant for prompting her to make change because "it felt wrong" and, perhaps echoing Paula's sentiment of things feeling wrong, the cover, secret and sacred stories of Laura, Holly and Sam were often tinged with doubt. They talked of the unsure approaches they took to their work; of the slow development of their practices as they learnt, largely by trial and error; of how the people around them could support or thwart their development; of challenges, tensions and compromises; of hopes and aspirations, successes and failures; of steady gains in confidence and competence; of shifts in identity; of change. Through their stories, I learnt some of the detail of what this period of time might be like for early career teachers generally and for those with an interest in primary mathematics education in particular. Fortunately, as Laura, Holly and Sam pursued and developed their interest in mathematics and endeavoured to shape positively the mathematical learning of the children in their care, they experienced enough small triumphs to light the way. The stories of Laura, Holly and Sam perhaps supplement the findings of T. Brown and McNamara (2011) by offering detail of the ways in which postgraduate and newly qualified teachers *can* see mathematics as having a subject-specific identity and the sorts of teaching strategies they *do* employ in recognition of particular features of mathematical thought and action.

A connectedness, apparent to me across the grain of the stories shared, concerns the significance of other people. The importance of others was signalled in Paula's story with mention of Head teachers, Deputy Head teachers, colleagues and local authority advisors as well as family members. People with similar roles and connections featured in Laura, Holly and Sam's stories too, along with the children they taught, and the parents of these children, and the teaching assistants and school-based mentors they worked with. The presence of a range of characters in people's narrative constructions of their experiences is not, in itself, remarkable but what pausing has offered me further awareness of is what G. Bateson (1985) might refer to as '*pattern through time*' (p.23, original italics).

For Paula, the recognition by others of her interest and strengths in mathematics education marked key moments in her career development, propelling her to new horizons. For Laura, Holly and Sam, the recognition given by others was also significant. For example, Cathy and Yvette, the school-based mentors of Laura and Sam during their PGCE year, both had an interest in the teaching and learning of primary mathematics and they accepted their mentees as people with expertise to bring. These mentors shared their views about mathematics education, encouraged experimentation with different approaches to teaching mathematics and invited Laura and Sam into their professional networks. One of my earlier wonderings was around whether the development of primary mathematics specialists is smooth or disrupted as they move from their postgraduate to their newly qualified teaching year and during the postgraduate year it seemed it was more likely for more people to be present: peers, tutors and mentors as well as colleagues and children. In the newly qualified year, the experiences of Laura, Holly and Sam showed primary classrooms to be lonely places in which it was possible to become isolated. When Laura, Holly and Sam were not recognised as having something to bring to the field of mathematics education, when they did not have people to tell their stories to, their potential was lessened and the development of their mathematical identity stalled. The quiet existence of unfailing support (there is

someone who believes in me and who will listen to my stories) could perhaps help early career teachers navigate the sometimes-lonely civilisation in which they might find themselves.

A return to Kaasila's (2007b) definition of mathematical identity is helpful here: 'One's mathematical identity is manifested when telling stories about one's relationship to mathematics, it's learning and teaching' (p.206). That other characters on the landscape may play a significant role in the development of an identity of a primary mathematics specialist is indicated: we need someone to tell our stories to. With Cathy and Yvette, Laura and Sam were able to share their interest in mathematics education, to tell their stories which then had the potential to come, as Speedy (2008) might say, to constitute an aspect of their lives.

Policy guidance advocates primary mathematics specialists being placed with school mentors who have expertise in teaching primary mathematics (AMET and NCETM, 2014). While this is, perhaps, as exemplified by the influences of Cathy and Yvette, the best-case scenario, my research would suggest it might not necessarily be essential. In listening to Paula and then pausing with Laura, Holly and Sam a pattern that connects their stories is one where the people who happen to be around them recognise the passion and interest for mathematics the new teacher in their midst brings. The preparedness to notice is perhaps more important than whether or not they have specific expertise themselves in the subject. Of course, it could be that a person with an interest in the learning and teaching of mathematics is more attuned to notice that same spark in others but ultimately it is the recognition that seems to be powerful for early career teachers. The proposal that early career primary mathematics specialists should be placed with established ones, as well as being perhaps not necessary, is also problematic. The call for bringing primary mathematics specialists into the field is a response to the perception that we do not currently have enough of them, so the recommendation is perhaps impossible to execute rendering the chance of development, if framed in this way, stymied.

Darragh (2016) conducts a review of literature with the aim of defining views of identity. She debates two opposing views, proposing the construct is commonly viewed either as: 'an action or an acquisition… a process or something we have inside ourselves' (p.26). Talking with Laura, Holly and Sam suggests they see their mathematical identities through both lenses. They all identified themselves as people who had been good at mathematics at school as a matter of fact, as if this aspect of their mathematical identity was a natural part of them. However, they also told stories of ways in which they were developing as teachers of mathematics through their daily actions and the witnessing by others of these actions was an important part of this developmental process. Here then is perhaps an alternative perspective on the persistent dream of having mathematics specialists in every primary school (Williams, 2008; DfE, 2013a). After talking with Laura, Holly and Sam, it is my contention primary mathematics specialists may already exist in abundance in our primary schools. However, if drawn with a deficit outline and left to work alone, what they have to offer and what is available to be nurtured, may go unnoticed. In pausing to see differently we might notice the primary mathematics specialists already in our midst.

Pausing has been important in other ways too. Throughout my recursive interactions with perpetually mushrooming data my attention was drawn to moments of fast and slow, fluency and hesitancy, run away talk and halts marked by pauses. The processes involved in conducting my research: re-listening to recordings, re-voicing conversations in transcriptions, repeating them in condensed storied and poetic forms, are perhaps all forms of pausing, of slowing down time. In being slow with data I have been more able to attend to both my lived experiences and to those of others. M. C. Bateson's (1994) observations strike a chord: 'To *attend* means to be present, sometimes with companionship, sometimes with patience. It means to take care of' (p.109). Influenced too by the views of Riesmann (2008), I have come

to see these processes as analytical ones and, for me, the data analysis phase of a research project does not exist in a clear and distinct period of time.

I recognise my descriptions of pausing in considerations of ways of being offered by others. Phillips (1993) recognises a 'state of suspended anticipation in which things are started and nothing begins' likening this state to one of boredom and advising us to hold the boredom experience rather than 'sabotage it by distraction' (pp.71-72). Iyengar (2013) suggests: 'The intellectual aspect of the mind gathers, collects and accumulates information, but has no power of discrimination'. He observes, in our daily lives, we are called upon to 'Act! Now! Immediately!' and proposes we tend to act impulsively: 'acting at once without giving a thought', using what is in our memory to guide our impulsive actions (p.57). I recall too M. C. Bateson's (1994) story of a building on fire and the possibility in resisting the urge to act.

While such views support me in explaining how a pause might give rise to new possibilities I still must consider: how might I pause in the first place? Having managed to create pauses in time, at first I stepped into them at my usual pace and my external and internal dialogues were dominated by my quick impositions. I had to learn to slow down in order to talk with Laura, Holly and Sam, to attend to what Connelly and Clandinin (1999) might call their cover, secret and sacred stories, those they lived by in their classrooms and schools. Much as the slowness promoted by the Slow Art Movement allows great works of art to be seen differently (Watts, 2019), being slow, while talking with Laura, Holly and Sam and with the data we constructed, meant I both heard different stories and heard them differently. Theirs were not neatly narrated stories with shiny beads marking life-changing moments and I had to learn to overcome some of my expectations and automatic behaviours in order to step into time and talk with Laura, Holly and Sam; I had to learn how to pause so I might remember to not speak for them and over them. I am reminded of Alf's words: 'forcing myself to hold back the analysis and stay with just the stories' (L. Brown and Coles, 1996, p.151)

and feel something of the commitment and energy required in order to come to see and know differently.

It is Iyengar's (2013) contention, through the practice of yoga, we might learn to create a space between thoughtlessness and thoughtfulness and draw on a stabilised, rather than fluctuating, mind to guide our actions. In order to develop the habit of pausing, that is, acting by not acting, practices like yoga and walking have supported me in being slow enough to discriminate and allow different associations to arise rather than persisting with remembered lines of thought and modes of action no longer of service. I suggest the mental, physical and philosophical practices of yoga and walking can support a propensity to be slow and the researcherly practice of dwelling in data can too. With less haste, new possibilities can arise and I can act anew. Perhaps such new responses are a mark of learning.

Laura, Holly and Sam were accepted as having expertise in mathematics while on their PGCE course; this identity was acquired and bestowed upon them by virtue of their A level results. During their PGCE school-based placements they carried the title of primary mathematics specialist by virtue of the mathematics specialist route they were taking. I wondered how they would fair in establishing their identities in the schools in which they were employed, as newly qualified teachers, where being viewed as a specialist might be measured against different criteria and a 'loss of status' (M.C. Bateson, 1994, p.71) might be experienced. As Paula explained:

> I don't know if you can short cut the time it takes to become a maths specialist . I think the idea of someone young coming in and trying to change things just because they have a maths A level or degree is a barrier. I am not sure that you can facilitate change just because you know about maths (Paula, Interview, February 2016)

I think Laura was largely happy to acquire the label of primary mathematics specialist. She was confident in the expertise she had to bring and was keen to offer this as soon as, and as often as, possible. Within the boundaries of her classroom she adapted pre-written plans and set about making her mark on the way in which the children in her class would learn mathematics, sometimes troubling the edges of practices accepted and expected by senior colleagues. Laura also moved beyond the boundary of the classroom and was involved in organising staff meetings aimed at developing the mathematical subject knowledge of her colleagues. For Laura, these activities all came under the heading of primary mathematics specialist. Holly and Sam seemed more hesitant to associate the term with their newly qualified teacher identities. Initially Holly was keen to make her credentials known but once advised by senior colleagues to not pursue a specialism in her newly qualified teaching year, she put the label to one side. And Sam, despite several prompts from me, never did explicitly tell her colleagues about her specialist course, her qualifications or her interest in mathematics. As explored earlier, in re-hearing myself using the label of primary mathematics specialist I noticed the weight of responsibility it carried. When I pinned the badge to them and asked "so tell me about what you have been doing as a primary mathematics specialist" while Laura offered a range of examples, Holly and Sam tended to focus on what they felt they had not been doing – not bringing new things in, not making enough of a difference to their children.

At first glance these retellings perhaps highlight difference but I suggest a pattern which connects (G. Bateson, 1985), is the identifying label of primary mathematics specialist was not necessary because it was not the label that defined Laura, Holly and Sam's interest in mathematics. Not only was the label unnecessary, it seemed to cause a distraction because Laura, Holly and Sam had to spend time and energy working out what they thought I thought they should be doing as primary mathematics specialists. Once able to act more thoughtfully, as a result of the stabilising influence of the slowing that came with dwelling in

data, I noticed the phrase “a person with an interest in mathematics” being more constructive; Holly and Sam in particular, seemed more comfortable and able to talk about their experiences when framed in this way. Over time, the content of their stories about their daily practices revealed their interest and involvement in supporting their colleagues in crafting learning opportunities based on fundamental mathematical knowledge; and their continued curiosity in possibilities for teaching mathematical concepts in a variety of ways which might prove helpful for their children. In short, they were acting in some of the ways in which a primary mathematics specialist, as defined by policy, might act (AMET and NCETM, 2014). Paula storied mathematics specialists as facilitators of change and I suggest Laura, Holly and Sam wore this mantle: they actively and purposefully made adaptations to their practices and shared their developing practices with others when possible and, by the end of their newly qualified year of teaching, were recognised by their colleagues as teachers who had a particular interest in the learning and teaching of mathematics. So, it seems a further insight, as a result of noticing connections, I may be in a position to offer is, in encouraging early career teachers to talk about what they are interested in, and exploring possibilities for them to act in ways which enable them to pursue these interests, could be helpful things for mathematics teacher educators to do.

Holly talked about an aspect of learning and teaching mathematics she was interested in during our first interview. She had noticed she was tending to plan more open or investigative mathematical activities after a series of more closed, skill-based questions. Gradually she became aware of two issues with sequencing learning opportunities in this way. The first was that some children never reached the more open and investigative questions because the entirety of the lesson was spent working on the closed questions. The second, even if some children did complete the closed questions with time available to move to the more open questions, they did not seem to be very committed to working on the

problems. Holly wondered if she might be encouraging different attitudes to different types of mathematical endeavour by always placing some tasks before or after others. In one of our university based sessions, as a cohort of mathematics specialists, we had worked together on an investigative task and Holly made a connection between this experience and the issues she was noticing in her classroom:

> Holly: when we had that maths session the other day and we were looking at the counters on the hundred square . I think as I did it I realised actually there are so many levels .. you could talk about factors and multiples or you could just talk about time stables _____ I'm not sure when I look for maths problems . that I really sit down . work on them and think about where they're going to go . so often I discount them or I don't think they will be appropriate _____ because I haven't gone through them myself . so I think after that I'm aware that actually they're a good place to start and perhaps I'll put more effort into thinking . "where could this go? what will they say? how would this help with their learning?". so rather than "you've got a new skill, see if you can you apply it here" . I wonder actually whether I've limited their creativity with maths . "I've taught you the skill . now apply that precise skill" rather than asking . "what can you bring to it?"
>
> Me: so is that something you are going to try and play with if you can? . it sounds as if it's caught your enthusiasm
>
> Holly: yes, yes, I think it would be a good thing . even if it's just one lesson a week they allow me to do it then that would be great
>
> (Holly, Interview 1, March 2016)

G. Bateson (1985) talks of being ready for discoveries when the opportunities come. At the time of this interview I am not sure I was ready to notice what I might notice now. Then I was caught up with the idea that Holly had a new lesson structure to try in the classroom

they're a good place to start

and the potential barriers Holly might face in attempting to structure lessons in a way not currently being filtered down the conduit in her school

even if it's just one lesson a week they allow me to do it.

T. Brown and McNamara (2011) might posit I was noticing administrative systems associated with the structuring of mathematics lessons and early career teachers making changes to established procedures. The slowing required to stay with data, to notice through the re-storying of ideas, perhaps induces the state of readiness G. Bateson (1985) talks of because now I notice Holly's interest in working on problems in order to come to know the potential for mathematical learning they might hold. While, as a mathematics teacher educator, I cannot, and indeed should not, expect to change the way in which Holly's school structures their mathematics lessons, I can work with Holly on open and investigative tasks and together we can ask

where could this go?

In amongst this discussion are the beginnings of some further binding ideas Clandinin (2007) I would like to communicate; I will spotlight them discretely now. When talking with early career teachers about their work, it is important I attend to their stories, their communications about their experiences. When I attend, even if I am called upon to give advice or support or share a connected story of my own, I can instead choose to pause, to

communicate by not communicating, because in invoking a space for another to speak into there comes the potential for change. Even if the same old story is voiced there is the possibility for it to be heard differently because it has been bracketed by silence. Finally, for now at least, in order to use slow practices, like attending and pausing, I need to work on being slow, on being able to pause. Being slow is perhaps the expertise a person talking with postgraduate and newly qualified teachers needs above all else because with this comes a capacity to notice differently. With the capacity and preparedness to see differently there is a possibility to reach beyond the deficit smokescreen of what is not yet mastered and what is not yet present; beyond what the impulsiveness of our memories tell us should be there.

Rabbit Holes and Rivers

This analysis brings me teetering to the verge of a number of methodological rabbit holes, philosophical and substantive issues I have raised throughout this inquiry now in need of further attention. While narrative inquiry accepts the mess of lived lives and loss of certainty in accord with a postmodern view committed to 'ambiguity, relativity, fragmentation, particularity and discontinuity' (Crotty, 1998, p.185), the narratives we create to communicate our experiences, to re-write our messy existence, rely on a kind of neat continuity with this leading to this and then that and then this. I am reminded of G. Bateson's (1985) words:

> Lineal thinking will always generate either the teleological fallacy (the end determines process) or the myth of some supernatural controlling agency (pp.71-72)

and then of Paula attributing her apparently neat but probably haphazard career path partially to luck and being in the right place at the right time. We can certainly re-write ourselves but looking forward demands we pre-write ourselves. In beginning to make forward and outward moves I find myself wondering to what extent is it possible to look forward from a narrative perspective of the philosophical kind? In posing research and interview questions that look to the future am I perhaps misguided? The significance of an idea voiced by Speedy (2008) and dropped casually into my writing earlier begins to hold new meaning for me: with a narrative mode of thought our stories 'both constitute and are constitutive of our lives' (p.xiv).

When I look back at Laura, Holly and Sams' Expressions of Interest, the ones written way, way back, before their PGCE year even began, it seems something of the experiences captured in these pieces of writing is carried forward, they reverberate. Laura, Holly and Sam all communicated a confidence with and enjoyment of mathematics with memories of school

days shaping their views. All recognised mathematics as a challenging subject: Laura mentioned difficulties she faced herself while Holly and Sam noticed struggles of pupils they had worked with. Beliefs about mathematics were peppered throughout their accounts: mathematics is important for success at school, daily life and career advancement; it is a subject all can excel in although struggle is expected and necessary because it is an inherent aspect of mathematical activity. For Sam, mathematics also transcended the everyday and was foundational to the arts. Laura highlighted the technical language of mathematics and declared an interest in the way children communicate mathematically. She made a link between deep, conceptual understanding and the scope for operating in the world. Holly communicated her awareness of the web of connections mathematics has across the curriculum. She was already thinking about how she might teach mathematical content to make it accessible and interesting to children. Sam, having explored the potential power of mathematical apparatus to support children in their learning, wanted to investigate this further.

It would perhaps be tempting to conjecture people who say such things will go on to become specialists and think if we design some snappy headings related to these themes and then sift and sort applications according to the pre-determined categories, we will have the people we need in our schools. Such a view can be challenged by G. Bateson's (1985) teleological fallacy and also by his view of stability and change. He gives the example of an acrobat's stability on a high wire being achieved through 'continual changes in descriptions of the acrobat's posture and the position of his or her balancing pole' (p.74). His teachings suggest, rather than noticing what appears to be stable and assuming it 'resists the passage of time' (G. Bateson, 1985, p.73), perhaps it might be helpful for mathematics teacher educators to notice small shifts in attention as these may offer potential to work with. G. Bateson's (1985) notion of transference is helpful here; it captures the idea of change as gentle, small, ghost-like even, something we might notice if we are wakeful but could easily miss if we are not:

> the shape of what happened between me and you yesterday carries over to shape how we respond to each other today. And that shaping is, in principle, a *transference* from past learning (p.24, original italics).

The stories of experience shared across Part Two do not tell of momentous moments, those that might be deemed critical incidents or turning points (Chapman, 2017b; Goodell, 2006; Kaasila, 2007a; Webster and Mertova, 2007), and perhaps it is only when we have reached a certain point and look backward that we can story our experiences in such ways. In working with narratives under construction, ones not yet stitched firmly into sequences and complete with neat endings, it would seem narrative inquiry can be thrown forward. The stories we tell travel with us, shaping what lies ahead as we continue. Interpreting stories through a lens of connectedness rather than cause and learning to story the small in order to notice subtle shifts and changes may be helpful in talking with people about their work and their developing practice and for being ready for discoveries when opportunities come.

It being impossible to step into the same river twice is a metaphor I keep stumbling across in my reading. Attributed to Dewey by Clandinin and Connelly (2000), to an ancient philosopher by Brockmeier (2000), to Heraclitus by Coles and Sinclair (2019) (perhaps Brockmeier's ancient), presented as a "well-known saying" by Metz and Simmt (2015) and purely as is by M. C. Bateson (1994), it is clearly a metaphor that resonates with social researchers. For me, it supports a view of the process of change being subtle and slow, so much so, it can appear things are staying the same until I enter a situation similar to one I have encountered before and find I bring an altered perspective. Much of the re-shaping of my perspectives in this study has come from using the ideas of others to story and then re-story experiences. This process has allowed different illuminations and multiple interpretations. I propose re-storying is an analytical approach supporting a flexible research practice, one challenging *right/wrong, best/worst* debates and allowing exploration of *what might work sometimes* to be a viable approach to development.

A slow development in my interests as I have studied has been in patterns in communication. Learning a little of the work of Watzlawick, Bavelas and Jackson, (1967) in their examination of the pragmatics of human communication and of G. Bateson's (2000) communication theory has equipped me to be ready to notice another rabbit hole. More than philosophical, this is a substantive issue connected to stories Laura, Holly and Sam told about their experiences, ones that could be interpreted as being unresolvable with any possibility for change quashed. G. Bateson (2000) offers double bind theory to describe sequences of such experiences. He characterises double binds as situations:

1) In which the individual is involved in an intense relationship; that is a relationship in which he feels it is vitally important that he discriminate accurately what sort of message is being communicated so that he may respond appropriately.
2) And, the individual is caught in a situation in which the other person in the relationship is expressing two orders of message and one of these denies the other.
3) And, the individual is unable to comment on the messages being expressed to correct his discrimination of what order of message to respond to, i.e., he cannot make a metacommunicative statement (p.208).

First I will illustrate the connection I am attempting to make between this theoretical frame and the stories of experience Laura, Holly and Sam told with a story I have told you about a couple of times already – the one about the label of *mathematics specialist*. My interpretation goes like this: Laura, Holly and Sam have a relationship with me. I am their university tutor. This relationship is made intense by the fact that, to some degree, I am a judge of their performance and get to say if they have or have not met the requirements of being a primary mathematics specialist. They therefore have a vested interest in proving to me that they have indeed met these requirements. However, Laura, Holly and Sam also have

an intense relationship with their colleagues but these colleagues, as described by Paula, are not convinced the

mathematics A level = mathematics specialist

equation balances. The very word specialist suggests someone must have been honing their skills for a long time and so it is potentially difficult for colleagues to accept an early career teacher making a claim to specialist credentials. These two conflicting communications (you are a specialist/you are not a specialist) place Laura, Holly and Sam in a double bind. Other examples of unresolvable positions are highlighted in the story Sam told about providing challenge for her pupils, a level of challenge promoted by senior colleagues but rejected by the children and their parents, and the one Holly told about breaking the mathematics down into ever-smaller bits that were never quite small enough. One order of message says "teach this way - it is the *right* way, the *best* way". Whether the particular message is either "you must provide a high level of challenge for your children" or "I must break the maths down" becomes immaterial. What is important is a message of "this is the *right* way, the *best* way" is being communicated, sometimes from external sources and sometimes from deeply held beliefs about learning and teaching mathematics and quite possibly a mixture of the two. A contradictory order of message then comes into play, this time from the children. The message they give is "we cannot learn mathematics in the way you are teaching us".

G. Bateson (2000) proposed his double bind theory as a result of studies of communicational patterns in observations of people described as schizophrenic. He observed that when such people were caught in double binds, they often developed ways of coping with communications from others by either becoming suspicious of their messages, laughing them off or trying to ignore them. These observations led to G. Bateson's third criterion for double binds: an individual is unable to comment on conflicting messages they receive. Clearly Laura, Holly and Sam were able to comment as they were able to tell me their stories

of experience, however, I suggest their communications were perhaps limited to some degree. In the first example of "you are a specialist/you are not a specialist" any comments they might make could place them at risk of either not meeting the requirements of their mathematics specialist course or of alienating their colleagues, possibly leading to the creation of cover stories (Connelly and Clandinin, 1999). In the second example, I propose the social and cultural narrative which says "there is a *best* way" is so entrenched in mathematics education it goes unnoticed as a human construct, a fictional reality open to question and examination and it has a powerful influence on the lives teachers can compose for themselves. Thus, Laura, Holly and Sam did not have different ways of communicating about the issues of learning and teaching mathematics concerning them because all of the information around them reinforced the dominant narrative of "the *best* way". Once the "*best* way" was not working the only available course of action available seemed to be to look for someone upon which to apportion blame:

it is not working because

I cannot do it properly

the children do not have the ability

the parents do not understand

the newly qualified teacher is not really a specialist

the experienced teacher is no good at mathematics

effectively leaving Laura, Holly and Sam with only cover stories of deficit to live by.

Watzlawick, Weakland and Fisch (2011) talk of 'terrible simplifications'. They suggest forms of attack (in this context the apportioning of blame) result from 'gross simplifications of the

complexities of interaction in social systems' (p.40). I suggest the *specialist/not specialist* and *best way* are two such simplifications. They are sacred stories on the landscape of mathematics education and they are perpetuated by myths like the expert/novice one and the *what works* one. These myths are alluring: they feel like satisfactory explanations, they are neat and quick and they play along with social norms. Like G. Bateson's (2000) observations of suspicion, ignoring and laughing off, Watzlawick et al. (2011) recognise the need for human beings to sometimes '*not* see, *not* hear, *not* think, feel or say' (p.42), in order to function as part of a complex group but suggest there are limits to taking such positions with any potential gains in the adoption of a position of denial sometimes being outweighed by disadvantages. The dichotomy of experts and novices ignores, or denies, the complexity of people working alongside each other in order to develop their practice. The quest for the *best way* or *what works* is perhaps a mutation of the expert/novice myth and it is perpetuated by the introduction of approaches to teaching wholesale into teachers' lives.

The approach to teaching mathematics advocated by the U.K.'s Department for Education and Employment (DfEE) in 1999 was the National Numeracy Strategy (NNS); Paula mentioned it earlier. Tailored training in this strategy was rolled out to all subject leaders of primary mathematics and they in turn cascaded the training to all primary teachers in their schools. The current incarnation of the *best* approach to teaching mathematics being promulgated in our education system is being shaped by results of the Shanghai Exchange Project (SEP). Laura, Holly and Sam spoke of the influence of this latest *best* approach, commonly spoken of as 'a mastery approach', in their schools. These examples illustrate their experiences:

the word mastery gets thrown around a lot

we try and teach with the mastery approach

but we are not sure about the mastery curriculum

people are a bit confused about it

on the planning it says activity: mastery

as if it's a separate thing

and differentiation doesn't even fit

(Sam, Interviews 3-5, December 2016 - August 2017)

While there may be helpful aspects to these big answers, some of which were identified by Paula in her stories of working with the National Numeracy Strategy, there are also pitfalls as discussed by Biesta (2007). The stories offered by Laura, Holly and Sam in their discussion of the mastery approach indicate how teachers in their schools were spending lots of time and energy trying to work out what is meant by a mastery approach just as we had spent a lot of time and energy trying to work out what a mathematics specialist was. A sense of dependency on others telling how things should be done was also apparent:

we had a mastery training day a few weeks ago

but having one mastery training day is not going to change anything

hopefully we'll move towards it more next year

when we've had some more mastery training

(Sam, Interviews 3-5, December 2016 - August 2017)

Recognising these myths and the binds they might tie us in is one thing. Breaking free of them is quite another. In the position of researcher, my role was perhaps not one of a facilitator of change, but in offering Laura, Holly and Sam the opportunity to see, hear, think, feel and say, these myths shaped our compositions. So, pausing to examine patterns of communication as I talked with Laura, Holly and Sam could be helpful in my movement forward as a mathematics teacher educator.

The expert/novice myth in the world of teacher education is explored by Kennard (1993). She talks of disentangling herself from the influence of previously accepted stories handed on from others and describes a process of examining her actions with earnest. Through this process Kennard noticed she had storied herself as an expert in her work with an early career teacher. Her awareness resonates: my use of the phrase primary mathematics specialist unwittingly perpetuated the expert/novice myth because if some people are specialists, or experts, or eminent, others must be novices. In addition, I implied Izzy and Holly in particular did not know enough yet, again storying them as novices and me as an expert. In attempting to re-story the relationship between teachers with different lengths of careers, Kennard found 'no ready answers' (p.172). However, if there were ready answers, they would of course be in danger of becoming quick fixes, *best ways*, *what works*. It seems there are not alternative ways of speaking of these issues; in this corner of civilisation it is easy to slip unawares into being part of an unhelpful conduit, one serving to limit development rather than support it.

In their studies of problem formation and problem resolution, Watzlawick et al. (2011) recognise a pattern they describe as 'more of the same' (pp.31-39). They observe that when a change is required, in an effort to make that change, we often are drawn to offer 'more of the same'. They note how in some situations, for example, continuing to turn up the heating inside as the temperature drops outside, a logical 'more of the same' strategy is helpful in achieving the desired change, in this case, a warmer home. They argue however that sometimes 'more of the same' is counterproductive. I have come to recognise 'more of the same' as a pattern which connects some of the stories of persistence and change I have been working with in this study.

One perspective on the story of using the phrase primary mathematics specialists is as a challenge to the established view that early career teachers cannot be specialists, and that I was attempting to affect change in my use of it, however, this offer could be considered as

being more of the same as it perpetuates the myth of experts and novices. While my overt challenge to Izzy about her provision for her pupils on the surface feels different it is still more of the same: "I am the expert because I know better and you are the novice Izzy because you do not know enough yet". Similarly, the recommendation of a book to Holly feels different but the text adopts the very approach Holly was finding unhelpful in her practice: it aims to break mathematics down into small parts and labels those parts as ones learners of mathematics tend to find difficult. While this could be a helpful aspect of a teacher's subject knowledge it perhaps would serve to reinforce an idea Holly was trying to change in her practice at this particular point in time; an example with a different texture perhaps but still more of the same.

The disadvantages of not engaging differently with myths of experts/novices and *what works* seem clear: if cover stories of administration and blame constitute our current conversations and are reinforced with more of the same, they will be constitutive of our future ones and the development of primary mathematics education potentially compromised. To move forward, and possibly outward, a re-storying is required. Freeman (2007) observes the human act of narrative sense making after events have happened and argues this is 'particularly so in the moral domain'. For him, the outcome of this retrospective connecting of dots results inevitably in a 'delay or postponement of insight' (p.132). Sacks (1985) gives a powerful description of a woman who, after suffering a stroke, was unable to see objects in their entirety, always missing part of what was in the left of her field of vision. She developed a routine of physically turning three hundred and sixty plus a few degrees more in order to be able to look anew at objects in front of her from a slightly adjusted orientation. By repeating this process several times over she could gradually see more and more of an object although never quite all of it. I am reminded of this woman each time I mentally turn to re-examine and then re-examine again experiences, each time from a slightly new perspective, each time the shape of one iteration being transferred forward to the next. More and more I

am noticing the moral domain of matters: the pinning and stamping of labels as an aggression, the perpetuation of myths as ethical malaise, the level of responsibility incumbent upon those who have decided to inquire into the affairs of others.

Highs and Lows

The adults in my class

Talk to each other

About

The highs and the lows.

I think Adam is a low

And Elsie is a high

Because

The adults look at Adam when they say low

And Elsie when they say high.

I'm not sure what I am.

I'm not a low low like Mark. No way.

Or a high high like Rosie. No chance.

I'm not sure what I am

Because they never look at me.

(Me, Digital Diary, March 2019)

As many before me have noted, it is not possible to step into the same river twice.

Seeing More and Seeing Differently

In my movements forward I am standing increasingly in the position of mathematics teacher educator, rather than researcher. From this perspective, I notice patterns in my communications indicating instincts to focus on possible beliefs shaping the practices Laura, Holly and Sam talk of in their classrooms, and the day-to-day strategies they employ to make them manifest. In response to this new noticing, I recall Laurinda and Alf's suggestion: working at either the level of central strategies, guided by often unconscious philosophical beliefs, or at the level of behaviours associated with micro-strategies is not necessarily productive when working with teachers in developing their practices (L. Brown and Coles, 1996). Specific teaching behaviours are particular to contexts and as such may not be possible to enact in different settings. In addition they operate at the surface of practice with one strategy relatively easily interchangable with another. I now question the image of development I might have been holding up to Laura, Holly and Sam, one of learning to teach mathematics as a mixture of cerebral ruminations and handed down behaviours, with no room for their own intuitions. I wonder if this image is distorted because I was seeing as a researcher or if it is indicative of the image of development I hold as a mathematics teacher educator.

In a final re-storying of Laura, Holly and Sam's experiences, I use my interpretations of Laurinda and Alf's ways of seeing in order to shape some final forward and outward movements on the landscape of mathematics education. To begin, I draw on their theories-in-action to frame minimal (Elliott, 2009) outlines of Laura, Holly and Sam's journeys across their postgraduate and newly qualified teacher years. I highlight examples of resonance and dissonance, guiding beliefs, purposes or 'motivations to act' (L. Brown and Coles, 2006, p.97) and the behaviours employed to carry out these motivations, in order to describe some of the images of mathematics Laura, Holly and Sam seemed to hold.

Laura wanted to plan lessons designed in such a way as to allow her children to shape the direction of their learning. She described examples of giving children choice about the work they could do and about the approaches they might use to solve mathematical problems. The creation of a classroom where children could converse with each other about their mathematical thinking was also important to Laura. To achieve this she considered how she might seat children so as to encourage a rich blend of ideas. For her, the mathematics curriculum was not just a list of pre-constructed knowledge to be imparted with correct answers to be established. Rather, to be mathematical involved thinking and acting creatively, exploring and talking and noticing. Within her classroom, Laura was often able to act in ways she found motivating, able to hold up an image of mathematics she felt was a positive one but, when she stepped beyond the boundary of her classroom, she found the opportunity to collaborate with colleagues largely unavailable to her and her guiding belief, that our learning is enriched by our collaborations, went unmet. It seemed, for her to be able to work in a way commensurate with her guiding beliefs, her options were either to wait to see for a bit, in case things changed, or to move to another setting in the hope a more collaborative network existed there.

A pertinent issue for Holly was how "breaking the maths down" did not seem to give the results she intended. Her experiences showed, time and again, this strategy did not serve her children in their learning of mathematics as she hoped it might, even though it seemed as if this was the logical thing for a teacher to do. Possible interpretations of Holly's guiding beliefs about learning and teaching mathematics are: mathematics is a discipline that can be broken into small skills which can, in turn, be taught by direct instruction and learnt through practice; practise skills first then apply is the correct order to do things in; making things easy and less threatening for pupils is an important part of being a good teacher. While Holly felt the grit of these ideas beginning to rub, she was unsure of how to move away from

the daily practices associated with her beliefs. She wanted to teach in a way supportive of children in noticing pattern, wanted to get them talking about their mathematical awarenesses, but was not sure how to. Perhaps these motivations did not quite fit with her guiding beliefs, resulting in a tussle between thought and action. Possibly one of the things holding Holly back was a guiding belief connected to the expert myth. She wanted to teach successfully and, it seems plausible, this aim for perfection could make it difficult to take the risk of trying new *hows* which might, or might not, work. This observation may indicate another aspect of her central, guiding beliefs: there is a *right* way to teach and it can be discovered. By the end of her newly qualified teaching year Holly seemed to have established some new ways of working: she was encouraging children to work systematically and supporting them to "just make a start" on problems. She had identified some of the behaviours she employed herself, as a successful mathematician, and was using them to shape the actions of her children in making a start: do something you have done before that was helpful; try something someone else has found helpful; draw a diagram and then another one and see what is the same and what is different. It was as if the image of mathematics Holly had seen in her children and considered lacking, was the one she had been holding up for them. It therefore seems possible, in making changes to her practice, she might project a different image and this could become the image of mathematics held by her children (L. Brown, 1992); her re-storied image of mathematics coming to be constitutive of future mathematical lives.

Sam's discussion of her practice indicated it was important for her to employ different representations to guide children in their learning of mathematics. Her aim was to make a bridge between concrete and abstract representations and experiences of mathematical ideas. For Sam, mathematics was a creative subject and fundamentally about concepts. She was aware working conceptually might present challenges for learners and teachers but she

viewed this challenge as inherent to the subject. A desire to make mathematical ideas clear and relatable was not guided by the primary aim of making mathematics easy but more that children might become confident in playing with mathematical ideas and applying them to novel situations. Irritant grit for Sam stemmed from feeling she did not always quite manage to achieve quite the right mix of learning opportunities to support children in developing the mathematical awarenesses she was hoping for. Early on in her PGCE course Sam saw this as a result of her not yet having had time to grapple with the many possibilities for working on mathematical ideas with children. Later, once in her newly qualified teaching year, dissonance seemed to come more from the way in which her colleagues viewed mathematics, which was perhaps as a skill-based subject, and the way in which Sam was required to plan and teach from their perspective. Tensions between different images of school mathematics and the beliefs shaping them became evident as she observed her lessons sometimes felt a "bit pointless" and became "things to get through this week". At other times, going through the motions of delivering lessons which compromised her guiding beliefs was the only option for Sam because she had to act to get lessons planned and delivered as best she could and did not yet know how else she might shape her lessons. By the end of her newly qualified year, perhaps more convinced of the beliefs shaping her practice, Sam felt in a stronger position to make changes:

I guess I've always had a vision

I've known what I wanted to do but not how

so I've been dabbling rather than fully going for it

but

I'm slowly becoming more able to shift it.

For both Holly and Sam the end of their newly qualified year of teaching seemed to be bringing a sense of resolve in some of the dissonances they had experienced. Holly was beginning to question some of the implicit structures she had been building lessons around

practise skills first then apply to problems

I'll tell you the *right* way to go about things then you repeat after me

and exploring other possibilities. It is feasible a reframing of her central beliefs about the nature of mathematics might follow, if her daily behaviours changed. Sam had tried to follow the guiding principles of others but explorations of the abrasions gained from working against her deeply held beliefs seemed to be giving her the conviction to follow her intuitions.

This distillation of Laura, Holly and Sam's experiences offers the possibility of continued forward and outward movement with regard to the philosophical and substantive tensions considered earlier. The story of mathematics seen as an administrative exercise, as described by T. Brown and McNamara (2011), is an important thread in my study. I suggest, in looking at the levels of guiding beliefs and teaching behaviours, we might see only a general or administrative engagement with the subject of mathematics. Giving children choice about how they might approach a task, breaking learning down into digestible pieces or arranging children to work in particular groups, could be considered as teaching behaviours, possibly influenced by guiding beliefs, which could be employed in any curriculum subject. However, in considering the space between beliefs and behaviours and the interplay across them, a teacher's engagement with what might be recognised as the mathematical-ness of school mathematics is apparent: the construction by pupils of mathematical concepts through dialogue; the noticing of pattern, same and difference; the application of conceptual

understanding in the form of conjectures and generalisations (Mason, Burton, and Stacey, 2010).

In their conclusions T. Brown and McNamara (2011) propose:

> Schoolteachers must be enabled to share the creation of mathematics in the classroom, rather than being mere conduits for a curriculum received from above. Faith must be placed in the teachers and their capacity to execute the policies and the associated curricula. They must hold on to their own professional voices so that they can participate more fully in curriculum evolution (p.146).

I agree wholeheartedly with these proposals but find myself wondering how this panacea might be achieved. A helpful small story to think with in order to explore this idea further is the one in which Sam talked about the use of the phrase

two three times

and observed:

> I think they wanted everyone to be doing it the same way across the school … and there's been quite a push on using accurate maths vocabulary as well so I think it was "times" instead of "groups of" … I don't know cos it's not wrong to do it the other way either . I don't know who decides (Sam, Interview 4, May 2017)

In this small story, this complex 'little knot' (G. Bateson, 1985, p.22), the teacher as a conduit for a curriculum received from above is apparent. An interpretation of this story could be the complexity of the multiplicative structure is being reduced to the level of a micro-strategy or teaching behaviour: "this is the way we will all read mathematical statements like these in our

school". I suggest it is also important to describe what is *not* present in the story: there is no discussion of the structure of multiplication, discussion with the potential to support the development of a professional mathematical voice.

Earlier I used the frame of double binds to interpret some of the difficulties Laura, Holly and Sam expressed in their communications about matters of importance to them in their day-to-day mathematical school lives. I propose a contributing factor to the entanglement in double binds, where administrative processes appear to be the ends-in-view kept at the forefront of a teacher's mind, are the impoverished languages of learning and teaching mathematics available to speak in. Solomon (1998) highlights the important role a teacher has in inducting children into mathematical talk and argues:

> The only way she can do this is to practise such talk herself and for learners to participate in those practices with her – they do not learn *from* talk, they learn *to* talk' (p.384, original italics).

While this argument positions the child foremost as the learner it recognises too the need for teachers to learn mathematical talk. It seems the narratives of deficit, administration and certainty shaping the stories lived by in schools, constitute the most available languages for teachers of mathematics to voice their experiences in, but that they confine teachers and their practices. My study indicates the need for the nurturing of a language currently underdeveloped in our schools, a language which early career teachers can talk in and so develop a professional mathematical voice to hold on to. As well as supporting the development of mathematical voices, attending to what is said when voiced is also important. As Chapman (2017a) explains 'understanding how to meaningfully support teachers' learning also requires understanding and attending to their thinking' (p.1).

Having learnt to establish new actions promoting talk of experiences and to re-story thinking pertinent to these experiences as a researcher with Laura, Holly and Sam, I can now consider

where I might place the focus of my attention as a mathematics teacher educator as I engage in talk with postgraduate teachers generally. Firstly, I propose attending to mathematical talk of the non-administrative kind:

I knew to start with the bigger number but I don't think I understood that it was the same as .. finding .. the difference and having a three and having a seven and counting the numbers in between or having seven and taking three away I don't think that was really .. secure

I didn't really realise there was a difference between "find the difference" and when you take one number away from another . I'd not really thought about that

yesterday we did subtraction ____ we drew five balloons and popped two and we talked about what it would look like as a number sentence and how when you take away you're getting rid of them so they crossed out two and counted how many were left

it feels as if it might be helpful to explore what a "count back" compared with a "count all" strategy could offer in supporting young children's developing knowledge and understanding of subtraction as "take away"

fold a piece of paper down the middle, open it out, and then shade one half . notice that one part out of two parts is shaded . fold the paper in half again and then in half again . notice two parts out of four and then four parts out of eight are shaded

I really struggled with fractions _____ we started by talking about it with some visuals and then I said, "right can you colour in half of these shapes" and they had a square cut into two and they all coloured in a half and that was fine . and a square cut into four and they all coloured in one part

there were elements when I thought we could have made more links ____ when I taught ratio, in the back of mind I thought I could link this to fractions but I didn't and I wish I had, but I didn't because I was like "oh no that will get a bit complicated and I might not be able to deal with that"

we were simplifying fractions ____ I couldn't come up with a really clear explanation for that phrase of "what we do to the bottom we do to the top" so I didn't want to use it . I wanted them to see it first

and the patterns across the stories in such talk. The patterns in these small stories of learning to teach others about subtraction and fractions I notice now are: teachers have different ways of seeing mathematical ideas; teachers communicate both their ways of seeing mathematical ideas and difficulties they have in seeing them; teachers want to help others see and communicate mathematical ideas. Focusing my attention on mathematical talk and on patterns across such mathematical talk is important for a number of reasons. My findings indicate it is during their PGCE year teachers are more likely to have other people around them to talk mathematical talk with, and voice possibilities for developing their practice to. I suggest engaging further in such talk might therefore support postgraduate teachers in beginning to develop a language of mathematics transcending talk at the level of the administration of the subject, the type of talk they are perhaps likely to encounter at school.

Secondly, I propose listening for and attending to talk at the level of purposes as important (L. Brown and Coles, 1997). I suggest purposes, or small stories of possibility, are present in the stories teachers tell of their experiences:

knowing how much stimulus to give and not to give

(Laura, Interview 2, June 2016)

learning to put yourself in the position of the learner

(Holly, Interview 5, August 2017)

having an emphasis on them not finding it easy

(Sam, Interview 5, August 2017)

and attending to them is important because such communications signal an opportunity for productive forward movement; something noticed in practice is sitting a little uneasily and is

ripe for change. Moreover, while the dissonant something being grappled with may have been brought to light through our talk together, it is something particular and personal to the individual wanting to develop their practice. It is articulated in their way with their words in their professional language. These possibilities for change are not demanded or imposed or quietly hinted at. They do not ask for the compromise of deeply held beliefs about learning and teaching mathematics. It is possible to imagine small shifts to the river of day-to-day behaviours being experimented with as such new motivations are held in mind. It is also possible to imagine shifts to deeply held beliefs, if different outcomes as a result of different behaviours were noticed, over time.

As well as listening for and hearing mathematical talk of the possibility kind, I might be able to support postgraduate teachers in being in a position to carry out their possibilities. Chapman (2008) advises:

> mathematics teacher educators should explore the possibilities that using the imagination can bring to the contribution of knowledge and deeper understanding of teaching mathematics (p.86)

and suggests imagining allows teachers 'to not only "talk the talk" of inquiry-based or reform oriented mathematics pedagogy, but to consider it in terms of living it' (p.86). Laura, Holly and Sam gave examples of wanting to make change to their practice but being stuck because they did not know *how* to bring different possibilities into play. Ebby (2000) suggests a goal for mathematics teacher education might be 'one of developing the kind of habits of mind that will help beginning teachers to continue to learn from their own teaching' (p95) and Greene (2011) describes imagination as 'the ability to enter alternative realities, to bring an 'as if' into being' (p.2). If I can imagine an alternative to say, breaking the mathematics down, and I can begin to describe that alternative, perhaps, changing the complexity of the mathematical situations I offer children to work on, I have a way to work on

continuing to develop my living practices in the mathematics classroom. I might, for example, talk *as if* I was a teacher who began a sequence of lessons with a mathematical investigation, which offered a more complete picture of the mathematical concepts I wanted the children in my class to learn about. I might talk *as if* I was introducing the investigation in two different ways; one in which I emptied the investigation of challenge and one in which I made it too challenging. I then might be able to talk *as if* it was offered in a way that felt about right for my children. Stepping into time with postgraduate teachers, listening as they talk their stories of possibility, and lighting them up with *as if* talk, may support the habit of a flexible forward-looking facility supporting the *hows* of new practices.

While gaining insight into the beliefs potentially guiding the actions of Laura, Holly and Sam was helpful for thinking about their stories of practice, attempting to transfer a set of beliefs from one person to another is problematic and could perhaps be described as a terrible simplification of the very nature of guiding beliefs. However, if the description of a purpose, a motivation for action from an enactivist perspective and a small story of possibility from a narrative one, resonates with another teacher or another mathematics teacher educator it seems plausible they might be moved to keep a similar possibility in mind. The potential for such resonance perhaps relies on some alignment with existing beliefs yet the day-to-day behaviours required to make the purpose manifest in practice can be constructed by an individual. However, more important than the generalisability of individual purposes themselves is the generalisability of the process of working with purposes, those distillations 'of a complex web of intentions, thoughts, past experiences and actions which inform my practice' (L. Brown and Coles, 1997, p.117). A purpose brings the distant past and the imagined future, close; close enough to intentionally and consciously affect change in the here and now. This requires stepping into time with a stabilised mind, stepping into a moment where it is possible to make adjustments. These changes will probably be small

shifts, almost discernible to an observer, after all, it is important for teachers to stay on the tightrope of an orderly classroom where many needs must be met, although they might be viewed as seismic when looked back upon some time later.

At the beginning of this chapter, I stood at the boundary of attending to my actions as a mathematics teacher educator by 'seeing more and seeing differently' (L. Brown and Coles, 2006, p.96). Until now, I have largely bracketed thoughts pertinent to my researcher and my mathematics teacher educator perspectives but, as I continue my movements forward and outward, I am increasingly aware of living at the tipping point between the two. This point was brought into focus when I talked with Izzy and overstepped into tutor mode and with Holly when I skirted around her classroom concerned questions. Sudden shifts in role definition left me on shaky ground, as I became neither one thing nor the other. Standing in between I see I am always a researcher, always a mathematics teacher educator. Words read long ago ring in my ears:

> there is only that which I bring to whatever context I am in – I cannot help but bring those perspectives to the range of activities in which I engage (L. Brown and Coles, 2006, p.96 (cited (L. Brown (with Coles), 1997, p.103).

I no longer see from the perspective of either a researcher or a mathematics teacher educator but one shaped by all of my previous experiences. I look 'toward the future with the knowledge of the past from the viewpoint of the present' (Conway, 2001, p.90). Working at the level of purposes, or possibilities, requires seeing between and across the guiding beliefs and teacher behaviours shaping practice and, I have argued, once this space is stepped into, a move beyond seeing the teaching of mathematics as an administrative exercise can be made. I suggest a similar re-focusing can be achieved by attending to the middle ground

between and across the novice/expert and *whatworks/whatdoesn'twork* divides, the space denoted by the / at the tipping point between one fixed state and another.

Sometimes I am more expert and sometimes I am more novice. Sometimes I do things and they seem to work and sometimes I do the same things and they do not seem to work. When they work I feel like an expert and when they do not I feel like a novice. Sometimes I really just do not know what to do so have to act and then consider my actions later. In this more uncertain place novices, experts, people, are described as being in a continual process of development where learning and change are the focus of attention rather than the label or the stamp attempting to definine a construction built on shifting sands. A story of uncertainty, rather than deficit, can thus become another helpful story to live by.

Earlier I used Dewey's (1958) notion of an end-in-view to shape my thinking about change and development but I now question this structure. While I might be trying to construct a path intended to take me to an end-in-view, this end-in-view is somewhere way off, distant. It is perhaps a teleological fallacy that I can lay a path to take me there because of the uncertainty of the future, the divergent nature of pattern (G. Bateson, 1985). With these ideas I disrupt the narrative of linear models of development because such models superimpose an, already illusory, neat backward-looking narrative structure on movements into an unpredictable, continuous future. I also disrupt a view of development as a process of becoming because a process of becoming suggests there is something to become while continuity does not seek an end point, a final destination.

Stengers (2018) states:

> The essential thing with 'matters of concern' is to get rid of the idea that there is a single 'right answer' and instead to put what are often difficult choices on

> the table, necessitating a process of hesitation, concentration and attentive scrutiny (p.3).

In my considerations of my experiences and those of others I have begun to describe three processes of hesitation, concentration and attentive scrutiny: storying the small, talking *as if* and re-storying. They are some of my *hows* of researching what I want, how I want.

Storying the small requires going slow enough to notice and then pay attention to the small. Laurinda and Alf's 'staying with the detail' and G. Bateson's view of a story as a knot of complexity (G. Bateson, 1985) have shaped my thinking about this narrative way of being. The research process gives access to so-small-as-to-be-easily missed data, as it is captured in research diaries and on recording devices. Noticing and attending to the easily missed is a way of travelling in partnerships of development as this process allows the noticing of patterns which connect, the distinguishing of what at first glance appears to be different but is often more of the same. It is, perhaps, a form of thick description (Geertz, 1993) and can provide impetus for change once patterns across descriptions are observed.

To talk *as if* brings the imagined, the possible, near. Talking *as if* I was a researcher, when going about the business of interviewing people, made me a researcher. Talking, through the written word, *as if* I was writing a PhD thesis, made my study apparent. Ends-in-view apply a backward looking connecting-of-dots perspective to what is yet to come. Ends-in-view leave the future beyond reach and reinforce the notion there is a right way to get somewhere with limited action possible until that right way has been unearthed. *As if* builds on the neat stories we make of our haphazard pasts, the patterns noticed across previous experiences. It provides loose moorings to work outwards from as we look forward and know the freedom in our futures. *As if* provides a way of continuing. Purposes, small stories of possibility, enable me to behave *as if*.

Barad (2014) explains: 'I want to begin by re-turning – not by returning as in reflecting on or going back to a past that was, but re-turning as in turning it over and over again' (p.168). She imagines re-turning 'as a multiplicity of processes' which open up and breathe new life in (p.168). The process I have come to think of as re-storying is like this. It uses frames for thinking provided by others as a way of achieving 'depth and richness' rather than allowing one view to dominate (L. Brown, Hewitt and Mason, 1999, p.93). This use of new perspectives is an iterative one and potentially without end because there are endless perspectives and with each new one I am a beginner again, standing 'at the threshold of that which I do not know' (Speedy, 2008, p.42). The process teaches me to be flexible, to see more and see differently.

Storying the small, acting *as if* and re-storying are all ways of attending, of taking care. These *hows* of research have become habits of mind, ways of being. They offer the creation of flexible stories to live by, ones which honour the motivations of individuals and enable them to continue without recourse to deficit models and terrible simplifications. These ways of attending resist the temptation of seeking a single right answer in a dusty catalogue of what worked. They recognise what people *can* do and value what they *might* do. When flexibility and uncertainty shape interpretations of our experiences and imaginations of our futures we might enter a space where we can establish a shared focus on the *hows* of our practices. While the fine grain of our attention might be in different places as we work on, for example, our *hows* of conducting research or our *hows* of teaching mathematics, the need for identity labels of researcher or teacher or primary mathematics specialist or mathematics teacher educator dissolves as we make an adjustment to be interested in *how* we are acting and learning and changing rather than *what* we might or might not become. From this perspective there is potential for the learning of different languages to talk in, ones supporting the shaping of varied professional voices. Learning to hesitate, and listen more and listen differently are necessary, if these voices are to be heard.

Learning to Attend

It turns out, whichever way I slice what I have created from the tangle of my experiences and those of others, this narrative inquiry develops, or is developed around, changes. I have charted changes in thoughts, communications and actions, ontological and epistemological viewpoints, beliefs, practices and habits and I have argued that being attentive to change may be helpful in my work as a mathematics teacher educator. I have used the theories of others as lenses through which to explore these experiences of change and now notice a connecting pattern: these theories are concerned with processes of changing, learning and developing, words which are, perhaps, all synonymous. G. Bateson (1985, pp.57-58) proposes 'the essence of learning and evolution is exploration and change' and explores pitfalls and possibilities in models of change. Dewey (1958) stories the process of learning as one of trial and improvement and M. C. Bateson (1990) as one of improvisation. Laurinda and Alf explore the development of mathematics teachers and mathematics teacher educators (see, for example, L. Brown and Coles, 2010). Kassila (2007, 2012) forms story lines to define developmental paths teachers describe. Clandinin and Connelly (1995, 1999) focus on individuals in their processes of becoming. Watzlawick et al. (2011) exemplify behaviours that might promote change and those that might stifle it. Stengers (2018) argues for attitudes to change barely tangible yet. Speedy's (2008, 2016) writings make me changeable. While this multitude of people and their thinking span both decades and fields of expertise, they all grapple with the perplexities of people changing.

I began this work by wanting to study the experiences of others, to attend to them. That I might know *how* to attend to the experiences of others was something I took for granted. Indeed it is probably more accurate to say that the requirement incumbent upon me to learn *how* to attend in order that I might carry out my intended research was so obviously staring me in the face, I did not even see it. One culmination of the many changes explored while I have been learning to research what I want, how I want, is that I attend differently. In this

final chapter, I seek to pattern some of the *whats* and *hows* of change supporting this process of learning by re-turning to some threads of thinking across the body of my work.

However.

One of the problems of a narrative position is the storying of a slick development and, now I have come to pay attention to being in it for a while, this is most certainly not how I experience the process of change. I have therefore decided to present the threads of my thinking in a series of moments of writing. I have several intentions in doing so: to disrupt the false chronology a backward-looking narrative view can present; to remain resolutely tentative and steadfast in my refusal to make something whole that might masquerade as a one-size-fits-all framework; to show incomplete ideas which might, or might not, become pathways for future study and, most of all, to embrace the potential in narrative inquiry to see more and see differently by being uncertain. Developing the capacity to be flexible in uncertainty seems, more than ever, a helpful possibility to attend to:

> The cars I see driving past my house are driven by people wearing white masks and latex gloves; Boris Johnson [U.K. Prime Minister] is in intensive care; Jamie Oliver [U.K. television chef] is using cheddar instead of mozzarella on his home baked pizzas. (Me, Digital Diary, April 2020)

While each moment has its own boundary, shaped by its title and position on the page, these are ideas unfinished. They flit, and overlap. I leave it to you to hear your own echoes.

‘Ch Ch Ch Ch Changes’

(Bowie, 1971, cited in L. Brown and Coles, 2010, p.375)

> It should be remembered that the only person who can do the changing is the person undergoing change (L. Brown, 1996, p.213).

> Trying to improve people by interfering with their own preferences often makes things worse (M. C. Bateson, 1994, p.219).

Along the way I have told stories relating to attempts to make others change and my noticings of the futility in doing so. My experiences have cultivated an awareness of attending to what **can** be changed. It is, for example, possible for me to change my habitual patterns of communication. It is also possible for me to shift the focus of my attention from the either/or of two previously described states, such as *what-works/what-doesn’t* or novices/experts, and consider alternative possibilities: what could be in between; what is not present; what are the ‘**entanglements**’, the ‘*chile* in the borscht’ (Barad, 2014, p.177, original italics)? I have also become aware of noticing opportunities where change might **flourish** noting, for example, the potential in focusing on the small adjustments I make in my practices.

While change cannot be done for me, others have been integral to the directions I have taken and the future paths I may tread:

> I am shaped by other minds. I sit here telling stories about human give and take, repeated encounters sometimes leading to growth, and all the words and concepts I use are old, inherited, part of the way I have been shaped by my environment (M. C. Bateson, 1994, p.75) .

and it seems change might come as a result of **connections** forming and leading to new ways of being. The making of my own connections is a solitary process but in it I am not **isolated** from the words and stories and experiences of others.

> If teachers can be aware of their decision-making processes, as they are happening in the moment, they will become more conscious of underlying assumptions which drive their behaviours, and open up the possibilities of getting rid of entrenched attitudes which have acted as brakes to their learning (L. Brown, 1996, p.226).

If.

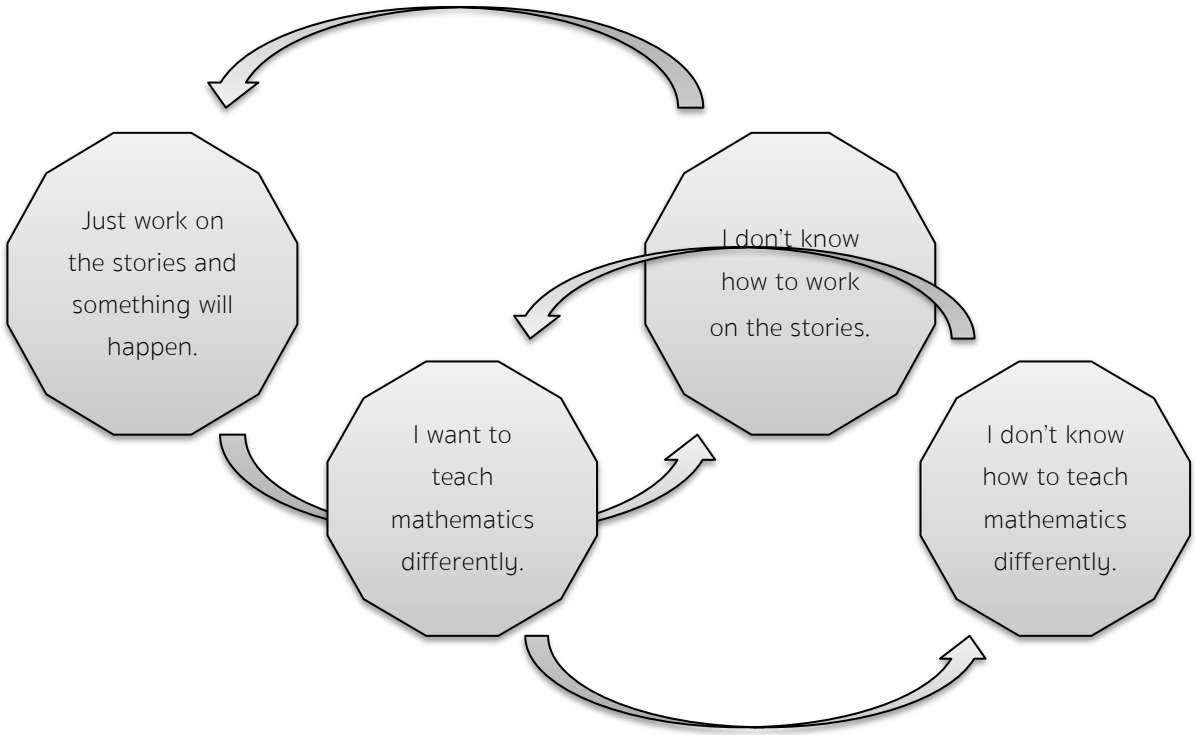
If I can be aware.

Reading the words of others supports me in being aware. Writing with borrowed words supports me in being aware. Gentle challenges from respected others. Taking time. Going slow. **Dwelling.** Conscious effort. **Concerted** effort. **Practising**. Wondering "what if" and hearing myself form and re-form ideas until I have my way of speaking my new awarenesses so I might attend to them.

The Resonance of Dissonance

I am practising attending to possible precursors of change and dissonance feels like one. Paula's first year where things felt wrong; my clumsy attempts at interviewing; Dobson's striving for rightness (L. Brown and Dobson, 1996). All dissonant chords resonating.

Not knowing how is a particular type of dissonance. It comes when we jump from a high wire we have learnt to balance on, with delicate almost unseen shifts, to a new one upon which we lurch from side to side to right ourselves.



Without a fluid retelling of this and then this and now this to fall back on, we suddenly need new stories to live by and so create, possibly unnoticed, stories of beginners coming to know how. This makes working alongside people entering a new profession a rich place to be. They are on a change trajectory and while I cannot do any changing for them it is perhaps important for me to attend to their process of change and development and be ready to notice when:

“I don’t know how” is declared.

When

the same old same old cover stories are told

again

and again

but their pages begin to curl at the edges.

When

sacred stories of the conduit are bumped up against

can’t go over them

can’t go under them

can’t go round them

have to go

in them.

I think I used to see dissonance as something to cure, to triumph over, but this is perhaps a terrible simplification. Dissonance is not a problem to solve. It is a vehicle for change. It signals care. Care carries a spark of energy. And change requires energy.

Feeling dissonance?

Walk this way.

The Narrative Potential

Dewey (1958) argues our experiments in improving have to be positive enough to allow further experience. Laurinda seeks to offer challenges to the people she works with so they might be moved to resolve their feelings of discomfort but asserts the level of challenge offered cannot be 'felt to involve any kind of catastrophic change to either behaviour or personality' (L. Brown, 1996, p.213). It seems there must be enough resonance in the dissonance for growth.

My diary, the digital one documenting my daily life and my research life alongside and in amongst, is littered with "I'm stuck"s and "this is beyond me"s and "I can't see where I'm going"s. As a *not* beginner, I sometimes proceed without questioning because my performance is so fluent: I know where I am going, I know the task in hand is within my capability and I can be fairly confident the result will be in line with my original aims.

Back in a different age, I worked in detail with Laura's and then Holly's and then Sam's data. Once I reached Sam's, already my ways of being were honed because I had more experience at working with data and writing stories of experience. But I had lost some spark, some intuitive impulse. I kept trying to be ahead of myself, knowing what I would make, before I had made it. Like works of art looked at quickly, stories too ready to tell might neglect alternative perspectives.

Attending to different possibilities, by thinking with a beginner's stories of inadequacy along the way, has been surprisingly helpful while keeping the end-in-view alone has not. On becoming a beginner again, I feel inadeqaute because I am thrown into that place where I don't know *what* and I don't know *how*. But, as a beginner, I have the opportunity to see differently. I have to attend to the things I am trying hard to grasp but cannot yet hold, and to the things I hold too tightly and must losen my grip upon.

In the preface of the Handbook of Narrative Inquiry (Clandinin, 2007) a query is raised:

> does narrative inquiry set out to change the world as people engage in the process of narrative inquiry with their participants, or is it a more descriptive kind of inquiry (p.xv).

When thrust into a beginner's space I need descriptions for my experiences. To an extent, I can match previous descriptions, ones I have in stock that resonate with current happenings, but I can also create new descriptions, I can choose to re-see. My re-seeings come through processes I have come to think of as storying the small, talking and writing *as if* and re-storying. In creating new descriptions, I attend differently and so I am changed and so the world around me is changed too.

If wakeful, a narrative position can be used to disrupt too easy stories of development:

there was this

and then this

and now

hey presto

this

and do more than locate and label our shiniest beads. While our quick, convenient, neat narrative re-constructions might suggest a linear development marching onward until finite points of expertise and *what works* are reached, narrative inquiry makes me a beginner again and in re-turning, re-imagining, re-storying, change and development are continuous. It seems to me, attending to continuity is a potential a narrative stance in social research has.

A Piece of Writing about Reflexivity II

While Geertz (1993) suggests ethnographic inquiry is defined by the intellectual effort of thick description, I propose narrative inquiry might be defined by the slow effort of reflexivity.

Clandinin and Connelly (1995) talk of a relational way of knowing as a cornerstone of narrative inquiry. My interpretation of this way of knowing is a placing side-by-side of something I am yet to describe with something I have previously described; my old images light my new descriptions and in the process are re-seen. In this way I form, extend and reform webs of connection.

As I have been engaged in the researcherly coming to know activity of this study, I have learnt a new language by reading the ideas of others and placing them beside my experiences and those of Laura, Holly and Sam. Some ideas spoke to me directly in the immediacy of now and the resonance gave me the courage to carry on. Others, such as Bruner's (1986, p.65) 'Naïve Realists', Freeman's (1998, p.29) 'beads in bare sequence' and Strawson's (2004, p.431) 'Diachronics', were incongruous when placed next to my existing descriptions yet the friction between them provoked unexpected branches of connections evolved slowly. With this new language, the one I speak as I write and hear as I read, I am able to communicate the new connections I make but only ever partially because the ideas dance too quickly for me to tie down to the page and because they are constant in their evolution and so cannot ever be known in entirety.

If the act of research is less about uncovering a static set of information and more about coming to know something of the complex associations people make in a world which is continuous and ever-changing, having an anchor point from which to explore is helpful. The anchor point in this study is me. While I thought it would be the experiences of others, I found it was only from the point of reference of myself there was the possibility of looking

backward, forward, inward and out, and to develop what Speedy (2008) describes as, 'the practice of continually noticing that there's a lot really going on' (p.19). Reflexive research dares to deal with data of the self and it speaks of a slow process of knowing by patch-working this and that, old and new, known and re-known.

A slow pace makes it possible to take a reflexive position, to travel with greater attention to thought and action by stepping into time and interrupting the usual stimulus response pattern. Or, to conduct a sort of introspective narrative interview. Or, to meditate on what has become familiar. Or, to be differently productive by *not* acting. Or, to be in the midst of experiences of change. Whichever way I choose to try and describe the process of reflexivity, knowing slow has had to be met with being slow. This is the deal.

While postmodern influences have shaped my thinking, with my moves from talking to listening and certainty to uncertainty guided by this philosophical positioning, I am increasingly interested in post-humanism and see the move from fast to slow as connected to this paradigm. I am beginning to question the impulse to place me at the centre and be curious as to other possible anchor points to attend to and from.

> Take twenty minutes off. Go for a walk in the fresh air and preferably nature. Notice how much time you spend looking at the ground as the mind continues its incessant dialogue. Look up at the tops of trees, look up to the clouds, see if any birds are flying. Notice the colours. How have they changed since the last time you were here? What sounds can you hear? Notice how loud your footsteps may be. Quieten them down. Keep moving energetically but quietly so that you do not scare the creatures with the noise of your distracted mind. Notice how far you can see and how far you can hear. Notice too the fact that you can still hear the sound of the blood hissing in your ears. Make a vow to come here more often (Shuffrey, 2000, p.30).

What If…?

In one realm of mathematics education a view of being mathematical involves working on problems slowly, creatively and collaboratively. This is a position advocated by some of the people and publications I have turned to and returned to over time: Boaler (1997, 2010, 2015), back copies of Mathematics Teaching (1955 to present), Skemp (1976), Mason, Burton, and Stacey (2010), Polya (2004), the Cockcroft Report (Cockcroft, 1982). However, it seems an expectation of postgraduate teachers to begin their teacher education programmes with the foundations of a teacherly knowledge base of mathematics already in existence and then emerge, at the end of their programme, fully made, entirely unaffected by earlier learning experiences. Classrooms and schools are fast-paced microcosms so these postgraduate teachers will enter up and running systems. They will be expected to know what to do and to fit in. They will be called upon to respond, quickly. Space and time and the authority to think are likely to be limited commodities. Yet Laura's new insights into subtraction, Holly's re-interpretation of breaking the maths down and Sam's querying of two lots of three or two three times, are stories telling of early career teachers of mathematics going through a process of re-learning what they thought they already knew, of attending differently to fundamental mathematical principles and working things out, that is, learning, as they continued.

The opportunity to talk about their learning went hand in hand with the development of their professional voices but, in talking with Laura, Holly and Sam, it seemed our newly qualified teachers might be required to develop their new languages of mathematics isolated from their peers, in conditions where an immediately fluent performance is expected and possibly under high stakes conditions to boot. I wonder if it is possible to have a system of learning resulting in mathematically nourished children if we do not extend the same privileged learning process to our teachers, who are also learners.

What if I chose to attend to the wisdom of postgraduate teachers and their deep concern with being effective practitioners (M. C. Bateson, 1990)? What if I worked to pause approaches and attitudes guided by quick recourse to what is already known and chose to cultivate flexibility and curiosity instead? What if I could develop proficiencies in recognising Watzlawick et al.'s (2011) *more of the same* and creating moments of discord so as to become a beginner again? What if I recycled the narrative interviewer's strategy of asking, "could you tell me more about…" and attended less to stories of experience and more to the development of professional voices? What if I encouraged a wondering of how mathematics lessons could be, and supported conscious experiments shaped by carefully considered motivations held before the mind? And what if we started to see our new images of working mathematically become the images of mathematics our children carried with them? What if we learnt to think with many stories of mathematics education, even easily overlooked ones, and to be cautious of making hurried adaptations in response to the drama of top-down administration and deficit?

I have always read the academic work of Laurinda and Alf and it has always inspired me but only now can I see I am perhaps grappling with some thoughts about teacher development similar to theirs. As a Master's and then PhD student under their supervision I have been guided by their ways of being over an extended period of time so having an affinity with their ideas and approaches probably should not come as a surprise yet it does because in their later work I do not see the similarity; their ideas are somewhere over there, beyond me, out of reach. In attending to their early work, when they were establishing their beginning practices and personal theories, I now relate to their ideas differently and I see I am beginning to be able to shape and voice my own purposes now. In choosing to attend to teacher talk differently, I am shaping my own purpose, my own small story of possibility, which has the potential to be constitutive of my mathematics teacher educator life. While catastrophic disruptions to our development might stop the potential for change in its tracks,

trying to jump on board and be in the same place as our teachers without attending to our own ways of seeing, albeit in the glow of the way they see, might ask for change too rapid to be realised.

In the dream
I am teetering
on the very top rung
of a very rickety ladder
looking through an open hatch
into a room.

Laurinda is in the room.
I reach through the portal and ask her to pull me in
but she can't.
I try to clamber in
but I can't.

I climb back down to get the taller ladder
but it's old and heavy and cumbersome and needs putting together.
I fuss with its awkward brass and leather fastenings
all the while wondering
if it is really up to the job.
I'm so busy fiddling around
I almost fail to notice the third ladder
a shiny
lightweight
telescopic triumph
right there
right in front of me.

It's the perfect ladder.
So perfect I don't need to climb it.
I'm already through and into the room.
(Me, Digital Diary, April 2020)

Self-based methodologies in the field of mathematics teacher education are gaining in number with a recognition of the contribution self-understanding can make to the advancement of our knowledge of teacher education (Chapman et al., 2020). There are spaces at conferences for researchers working on papers exploring self-based methodologies, like narrative inquiry, to be stepped into (Helliwell, 2019; Chapman, 2020) and academic journals interested in publishing such work (Hjalmarson, 2017; Kastberg, Lischka, & Hillman, 2020). Narrative inquiry has been viewed as an empathetic methodology (Chapman et al., 2020). I suggest it is also a slow methodology and through the process of living slow research, as we take time to story the small, re-story, write as if, there comes space in which we might suspend our often automatic recourses to action, allowing other possibilities to be made apparent, lived.

What if my work and thinking was accepted on the landscape of academia and I could step more fully into the blurry spaces between and amongst my mathematics teacher educator / researcher lives? What would my stories of possibility be? To create slow spaces in which slow practices might be explored and developed. To sustain the professional voices of teachers of primary mathematics and mathematics teacher educators by attending to patterns in their talk. To learn at the pace of walking in conscious collaborations and create narratives of experience that might transcend the schisomogenesis between novices and experts, what works and what doesn't.

These small stories of possibility are constitutive of my, hoped for, in between life.

Day One

September. A new academic year and a new cohort of postgraduate teachers are beginning their PGCE programme. Tomorrow I will meet a group of these teachers, twelve people who have been successful in their application for a place on the primary mathematics specialist route. Over the summer, I read their Expressions of Interest, short pieces of writing in which they talked about their experiences of learning and teaching mathematics and their interest in the subject. They wrote about their successes in exams, the influences of friends and teachers and family members. Some wrote about mathematics anxiety, some about instrumental and relational understanding and some about mastery. They all wrote about their hopes of becoming good primary teachers who might make learning mathematics engaging and meaningful for the children they will soon be teaching.

To begin our first session together I am planning on inviting each person to voice something of what brings them to this group and also to talk about the type of learning opportunities they imagine creating for their children. I intend to set a slow pace punctuated with deliberate pauses, so as to make space for previously unvoiced ideas to surface, and also to set a tone for the way in which we will work together over the next ten months or so. As I listen, I will make note of well-formed ideas presented fluently but will attend with particular care to those that come haltingly. I have prepared brown envelopes (well, digital folders located in the cloud) for each postgraduate teacher and will be dropping readings connected to these still forming ideas, the ones with space for change, into them.

Then, to support the voicing of mathematical talk, we will work on structures of subtraction together. I can be confident the postgraduate teachers will be familiar with the concept of subtraction and that they will have a range of strategies for subtracting one number from another. We will explore the different ways we see subtraction and communicate our ways to each other. As we work, I will note the *hows* of our communications especially the things we do to help others see our ways of seeing. I will try to make fairly detailed records because I

intend to take my notes away with me and play with storying the small, writing *as if* and re-storying, in order to shape our future work together.

I anticipate being fairly silent as we work. I am confident any pauses will be filled and, if necessary, I can make use of prompts like "could you tell me more about… your way of seeing subtraction, the diagram you have drawn, your interpretation of your new friend's way of seeing subtraction…" to restart and refocus the mathematical talk it might be helpful for us to learn to speak while we are together.

Towards the end of the day, I will ask the postgraduate teachers to arrange to observe a teacher teaching the concept of subtraction to children when they go into their schools. I will ask them to focus on the ways of seeing subtraction the teacher offers her or his children and to draw some diagrams to represent these ways of seeing. I will ask them to note down examples of talk, either child talk or teacher talk, they find of interest as they listen to what is said. I will ask them to prepare a short presentation to communicate what they saw and heard to our group when we next meet. During these presentations, when the time comes, I will be wakeful to stories of administration and deficit, and to the use of labels. I will try not to be distracted by them, as I know this is a habit of mine. I will also remember my tendency to tune into stories of experience guided by beliefs. I will make a space for the re-voicing of the mathematical talk spoken, and for the storying of flexible possibilities for practice these postgraduate learners/teachers with an interest in mathematics, might like to attend to as they continue.

Postscript

Since completing the sequence of interviews with Laura, Holly and Sam, I was a participant in a branch meeting of the Association of Teachers of Mathematics led by Laura; Holly emailed me to share the news her Head Teacher had asked her to apply for a professional development course titled the Primary Mathematics Specialist Teacher Programme; and Sam contacted me to ask for a reference as she was thinking about applying for a new job or possibly travelling for a while.

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Appendices

Appendix 1: Table of interviews

Date of interview	Teacher	Point in career	Location of interview	Length of interview	Context of interview
July 2014	BM	Term 6 PGCE	My office	26:28	Current experiences
July 2014	NP	Term 6 PGCE	University study space	29:17	Current experiences
July 2014	JB	Term 6 PGCE	My office	39:04	Current experiences
July 2014	SA	Term 6 PGCE	Café	31:23	Current experiences
July 2014	CJ	Term 6 PGCE	My office	32:53	Current experiences
July 2014	DP	Term 6 PGCE	School classroom	26:13	Current experiences
July 2015	JB	Term 6 NQT	Café	39:04	Current experiences
July 2015	DS	Term 6 PGCE	School classroom	Recording lost	Current experiences
Nov 2015	JB	Term 2 NQT +1	Café	56:09	Current experiences
Nov 2015	NP	Term 2 NQT +1	School classroom	75:18	Current experiences

Jan 2016	PC	Experienced mathematics subject lead	School library	25:31	Views on early career primary mathematics specialism
Feb 2016	Paula	Experienced primary mathematics specialist	School library	42:24	Life story of becoming a mathematics specialist
Feb 2016	JH	Term 3 PGCE	School classroom	33:45	Current experiences
Feb 2016	JS	Term 3 PGCE	University café	36:56	Current experiences
March 2016	Laura	Term 4 PGCE	My office	37:08	Talk about recent lesson
March 2016	Sam	Term 4 PGCE	My office	27:16	Talk about recent lesson
March 2016	Holly	Term 4 PGCE	My office	36:24	Talk about recent lesson
March 2016	DS	Term 4 NQT	School classroom	36:07	Current experiences
March 2016	HW	Experienced primary mathematics	School office	35:13	Life story of becoming a mathematics specialist

		specialist			
May 2016	RPS	Head Teacher	University study space	21:55	Views on early career primary mathematics specialism
May 2016	JG	Term 5 NQT	Café	34:34	Current experiences
May 2016	EC	Term 5 PGCE	School office	37:17	Current experiences
June 2016	JS	Term 6 PGCE	School classroom	29:56	Current experiences
June 2016	Laura	Term 6 PGCE	University study space	33:01	Development of mathematics specialism
June 2016	Holly	Term 6 PGCE	University study space	28:26	Development of mathematics specialism
June 2016	Sam	Term 6 PGCE	University study space	10:35	Development of mathematics specialism
July 2016	JB	Term 6 NQT+1 year	Café	56:09	Current experiences
July 2016	DB	Experienced school based training mentor	School playground	19:03	Views on early career primary mathematics specialism
Nov 2016	Izzy	Term 2 NQT	School	22:26	Current experiences

			classroom		
Dec 2016	Laura	Term 2 NQT	School classroom	29:07	Current experiences
Dec 2016	Sam	Term 2 NQT	School office	31:37	Current experiences
Dec 2016	Holly	Term 2 NQT	Café	42:12	Current experiences
Feb 2017	KC	Head Teacher	School office	22:32	Views on early career primary mathematics specialism
April 2017	Holly	Easter holidays between Term 4 and Term 5 NQT	Café	68:16	Current experiences
April 2017	JB	Term 4 NQT+2 year	Café	52:13	Current experiences
May 2017	Laura	Term 5 NQT	School classroom	62:33	Current experiences
May 2017	Sam	Term 5 NQT	School playground	42:28	Current experiences
July 2017	JB	Term 6 NQT+3	Café	75:58	Looking back / looking forward

August 2017	Sam	Summer holidays between NQT and NQT+1	School classroom	67:30	Looking back / looking forward
August 2017	Holly	Summer holidays between NQT and NQT+1	Café	72:20	Looking back / looking forward
Oct 2017	Laura	Term 1 NQT+1	School classroom	76:45	Looking back / looking forward

Appendix 2: Glossary of acronyms and explanation of terms

Association of Mathematics Education Teachers (AMET): national organisation representing voices of mathematics educators in the U.K.. https://www.ametonline.org.uk

Association of Teachers of Mathematics (ATM): membership of the Association of Teachers of Mathematics (ATM) is open to anyone with an interest in learning about and teaching mathematics. ATM supports teachers in exploring strategies, which help learners to enjoy and discover more about mathematics. https://www.atm.org.uk/Home

Department for Education (DfE): a department of Her Majesty's Government responsible for child protection, education (compulsory, further and higher education), apprenticeships and wider skills in England (2010-present).

Department for Education and Employment (DfEE): a department of Her Majesty's Government responsible for child protection, education (compulsory, further and higher education), apprenticeships and wider skills in England (1995-2010).

Early career mathematics teacher educator: in this study, this phrase refers to a person who has been working as a mathematics teacher educator for up to five years.

Early career teacher: in this study, this phrase refers to any teacher in their first five years of teaching (including postgraduate and newly qualified teachers).

Early career researcher: in this study, this phrase refers to a person who has been working as a researcher for up to five years.

Early Years Foundation Stage (EYFS): the Early Years Foundation Stage sets standards for the learning, development and care of children in England from birth to 5 years old. https://www.gov.uk/early-years-foundation-stage

Initial Teacher Education (ITE): refers to courses in England designed to enable people to become teachers on completion.

Mathematics Specialist Teacher Programme (MaST): a two-year professional development programme, available through some ITE providers in England, in mathematics for primary teachers.

Maths Hubs: government funded mathematics education networks situated throughout England. https://www.mathshubs.org.uk

Mathematics Teaching (MT): the journal produced by the Association of Teachers of Mathematics (ATM).

National Numeracy Strategy (NNS): launched in 1998 and implemented in schools from 1999 to 2011, this strategy was designed to facilitate a sound grounding in mathematics for all primary school pupils and aimed to raise standards of achievement in mathematics nationally.

Newly Qualified Teacher (NQT): refers to a person who has successfully completed a Postgraduate Certificate in Education course and been recommended for QTS and is currently undertaking their first year of employed teaching.

National Centre for Excellence in Teaching Mathematics (NCETM): organisation funded by the Department for Education (DfE) aiming to raise levels of achievement in mathematics and to provide teachers with access to continuing professional development opportunities. The main channel of support for teachers and schools is through the Maths Hubs Programme, which the NCETM leads.

National Curriculum (NC): The national curriculum for England is taught in all local-authority-maintained schools. https://www.gov.uk/government/collections/national-curriculum

Numbers Count: an intensive intervention for learners in Years 1 to 8 who have the greatest difficulties with mathematics. A specially trained teacher, who also supports other staff, delivers the intervention programme.

Postgraduate Certificate in Education (PGCE): one of the main routes to becoming a teacher in the U.K.. Offered in England, Wales and Northern Ireland, most PGCEs give Qualified Teacher Status (QTS) making graduates eligible to teach in countries across the world.

Postgraduate teacher: in this study, refers to a person who is currently learning to be a teacher through a Postgraduate Certificate in Education course and working towards Qualified Teacher Status (QTS).

Qualified Teacher Status (QTS): teachers must have qualified teacher status to take up a teaching post in England in a maintained primary school, maintained secondary school, maintained special school or in a non-maintained special school. When a PGCE teacher completes their course successfully their initial teacher education provider informs the Department for Education (DfE) of their results. The DfE awards QTS.

Senior Leadership Team (SLT): typically a group of administrators, teachers, and other staff members who make decisions in a school and/or who lead school-improvement initiatives.

Shanghai Exchange Project (SEP): an initiative led by the NCETM with the aim of English teachers learning from teaching approaches used in Shanghai schools.

Standard Assessment Tests (SATs): national tests children in England take twice during their primary school life. Firstly, at the end of Key Stage 1 (KS1) in Year 2 (aged 6-7 years), and then secondly, at the end of Key Stage 2 (KS2) in Year 6 (aged 10-11 years).

We Are Learning To (WALT): teachers in English primary schools sometimes use a phrase to capture the key focus of learning in a lesson. WALT stands for 'we are learning to'. At the beginning of a lesson a teacher might say, for example, 'today we are learning to identify fractions equivalent to one half' and on the board in the classroom they might display: WALT: identify fractions equivalent to one half. Other common phrases used in a similar way are Learning Objective (LO) and Learning Intention (LI).

Appendix 3: Ethics Documents

3a: Consent Form

Title (draft): Primary mathematics specialist teachers, teacher educators and researchers: narratives of being, learning and doing

I confirm that I have read and understood the participant information sheet for this project and the researcher has answered any queries to my satisfaction.

I understand that my participation is voluntary and that I am free to withdraw from the project at any time, without having to give a reason and without any consequences.

I understand that I can withdraw my data from the study at any time.

I understand that any information recorded in the study will remain confidential and no information that identifies me will be made publicly available.

I consent to being a participant in the project.

I consent to our conversation being audio recorded and know that I can stop the recording at any time and delete the recording if I choose to.

I consent to the information I volunteer being used to create narrative re-presentations of my views and experiences.

Name:	
I am happy to be contacted after the interview to review writing (Group 2 and 3):	Yes / No
I understand that participating in this project involves five points of contact over the period from Nov 2016-July 2017 and the review of narratives produced:	Yes / No

Signature:	
Date:	

If you have any concerns, during or after the research project, or wish to contact an independent person to whom any questions may be directed or further information may be sought from, please contact: Laurinda Brown at laurinda.brown@bristol.ac.uk orgsoe-ethics@bristol.ac.uk

3b: Participant Information Sheets

Group 1 Participant Information Sheet

Title of the study (draft):

Primary mathematics specialist teachers, teacher educators and researchers: narratives of being, learning and doing

What is the purpose of this research?

I aim to create a piece of work that offers further knowledge and understanding of the topic of early career primary mathematics specialism. I see this work as having the potential to inform primary mathematics specialist routes on ITE and NQT programmes and also that it may offer awarenesses to current early career primary mathematics specialists and those considering such a route in their teaching careers.

Do you have to take part?

Participation is on a voluntary basis.

Why have you been invited to take part?

There are three groups of people I would like to represent in this work:

Group 1: early career primary mathematics specialists

Group 2: Head teachers interested in having early career primary mathematics specialists in their staff teams

Group 3: established primary mathematics specialists.

I am inviting your contribution as a Group 1 participant.

What will you do in the project?

Group	Who?	Involvement?
1	4 early career primary maths specialists	3x narrative interviews around Dec 2016, March2017 and July2017 (1 hour per interview) 2x group discussions around Feb2017 and May2017 (1.5 hours per discussion at university / local school or by Skype for people outside the Bristol/Bath area) Review of narratives produced (timings will depend on the completion of narrative documents) Project closes July 2017
2	4 Head teachers	1x narrative interview of 45 mins in Jan/Feb 2017 Opportunity to review narrative re-presentation and give

		feedback
3	4 established primary maths specialists	1x narrative interview of 45 mins (before July 2017) Opportunity to review narrative re-presentation and give feedback

Reimbursement:

The researcher will reimburse any travel and parking costs incurred.

What happens to the information in the project?

Our discussions will be written as narrative re-presentations designed to inform debate on early career primary mathematics specialism. Your comment on any representations is welcomed. These narratives will form the basis of my PhD thesis. It is also possible that I may present this work at conferences, produce journal articles and contribute to books.

To ensure confidentiality any identifying information about any participants will not be exposed in any way and data will be reported generally. Pseudonyms (of your choice) will be used to disguise personal identifiers in any written reports, publications, and presentations. All personal data on participants will be processed in accordance with the provisions of the Data Protection Act 1998; University of Bristol guidance can be accessed at http://www.bris.ac.uk/secretary/dataprotection/materials.html

What happens next?

If you would like to contribute data to my research I would be very grateful and would love to hear from you - please contact me at an email address below for further information. If you do not want to be involved I would like to thank you for your time in reading this and for giving your consideration to this research.

Researcher contact details:

Caroline Ormesher co13901@bristol.ac.uk or c.ormesher@bathspa.ac.uk

Group 2 Participant Information Sheet

Title of the study (draft):

Primary mathematics specialist teachers, teacher educators and researchers: narratives of being, learning and doing

What is the purpose of this research?

I aim to create a piece of work that offers further knowledge and understanding of the topic of early career primary mathematics specialism. I see this work as having the potential to inform primary mathematics specialist routes on ITE and NQT programmes and also that it

may offer awarenesses to current early career primary mathematics specialists and those considering such a route in their teaching careers.

Do you have to take part?

Participation is on a voluntary basis.

Why have you been invited to take part?

There are three groups of people I would like to represent in this work:

Group 1: early career primary mathematics specialists

Group 2: Head teachers interested in having early career primary mathematics specialists in their staff teams

Group 3: established primary mathematics specialists.

I am inviting your contribution as a Group 2 participant.

What will you do in the project?

Group	Who?	Involvement?
1	4 early career primary maths specialists	3x narrative interviews around Dec 2016, March2017 and July2017 (1 hour per interview) 2x group discussions around Feb2017 and May2017 (1.5 hours per discussion at university / local school or by Skype for people outside the Bristol/Bath area) Review of narratives produced (timings will depend on the completion of narrative documents) Project closes July 2017
2	4 Head teachers	1x narrative interview of 45 mins in Jan/Feb 2017 Opportunity to review narrative re-presentation and give feedback
3	4 established primary maths specialists	1x narrative interview of 45 mins (before July 2017) Opportunity to review narrative re-presentation and give feedback

Reimbursement:

The researcher will reimburse any travel and parking costs incurred.

What happens to the information in the project?

Our discussions will be written as narrative re-presentations designed to inform debate on early career primary mathematics specialism. Your comment on any representations is

welcomed. These narratives will form the basis of my PhD thesis. It is also possible that I may present this work at conferences, produce journal articles and contribute to books.
To ensure confidentiality any identifying information about any participants will not be exposed in any way and data will be reported generally. Pseudonyms (of your choice) will be used to disguise personal identifiers in any written reports, publications, and presentations. All personal data on participants will be processed in accordance with the provisions of the Data Protection Act 1998; University of Bristol guidance can be accessed at http://www.bris.ac.uk/secretary/dataprotection/materials.html

What happens next?

If you would like to contribute data to my research I would be very grateful and would love to hear from you - please contact me at an email address below for further information. If you do not want to be involved I would like to thank you for your time in reading this and for giving your consideration to this research.

Researcher contact details:

Caroline Ormesher co13901@bristol.ac.uk or c.ormesher@bathspa.ac.uk

Group 3 Participant Information Sheet

Title of the study (draft):

Primary mathematics specialist teachers, teacher educators and researchers: narratives of being, learning and doing

What is the purpose of this research?

I aim to create a piece of work that offers further knowledge and understanding of the topic of early career primary mathematics specialism. I see this work as having the potential to inform primary mathematics specialist routes on ITE and NQT programmes and also that it may offer awarenesses to current early career primary mathematics specialists and those considering such a route in their teaching careers.

Do you have to take part?

Participation is on a voluntary basis.

Why have you been invited to take part?

There are three groups of people I would like to represent in this work:

Group 1: early career primary mathematics specialists

Group 2: Head teachers interested in having early career primary mathematics specialists in their staff teams

Group 3: established primary mathematics specialists.

I am inviting your contribution as a Group 3 participant.

What will you do in the project?

Group	Who?	Involvement?
1	4 early career primary maths specialists	3x narrative interviews around Dec 2016, March2017 and July2017 (1 hour per interview) 2x group discussions around Feb2017 and May2017 (1.5 hours per discussion at university / local school or by Skype for people outside the Bristol/Bath area) Review of narratives produced (timings will depend on the completion of narrative documents) Project closes July 2017
2	4 Head teachers	1x narrative interview of 45 mins in Jan/Feb 2017 Opportunity to review narrative re-presentation and give feedback
3	4 established primary maths specialists	1x narrative interview of 45 mins (before July 2017) Opportunity to review narrative re-presentation and give feedback

Reimbursement:

The researcher will reimburse any travel and parking costs incurred.

What happens to the information in the project?

Our discussions will be written as narrative re-presentations designed to inform debate on early career primary mathematics specialism. Your comment on any representations is welcomed. These narratives will form the basis of my PhD thesis. It is also possible that I may present this work at conferences, produce journal articles and contribute to books.

To ensure confidentiality any identifying information about any participants will not be exposed in any way and data will be reported generally. Pseudonyms (of your choice) will be used to disguise personal identifiers in any written reports, publications, and presentations. All personal data on participants will be processed in accordance with the provisions of the Data Protection Act 1998; University of Bristol guidance can be accessed at http://www.bris.ac.uk/secretary/dataprotection/materials.html

What happens next?

If you would like to contribute data to my research I would be very grateful and would love to hear from you - please contact me at an email address below for further information. If

you do not want to be involved I would like to thank you for your time in reading this and for giving your consideration to this research.

Researcher contact details:

Caroline Ormesher co13901@bristol.ac.uk or c.ormesher@bathspa.ac.uk

3c: Graduate School of Education Research Ethics Form

Name: Caroline Ormesher

Proposed research project:

Primary mathematics specialist teachers, teacher educators and researchers: narratives of being, learning and doing

Proposed funder(s): NA

Discussant for the ethics meeting: Ruth Barrington

Name of supervisors: Laurinda Brown and Alf Coles

Has your supervisor seen this submitted draft of your ethics application? Yes

Please include an outline of the project or append a short (1 page) summary:

I plan to research the development of early career teachers following a general primary practitioner training route with a specialism in primary mathematics. My intention is to create an account of the experiences of early career practitioners as they become primary mathematics specialists. I am interested in research that informs my practice and communicates the experiences of people.

In the drive to improve standards in mathematics education it seems plausible that school leaders may turn increasingly to draw on specialist skills and knowledge at primary schools. Yet how do people become primary mathematics specialists and what is their journey of development like? What can we learn from early career primary mathematics specialists and their experiences that might inform those involved in teacher education, both school and university based?

The idea that early career teachers can act as specialists seems in tension with traditional frameworks of teacher development which suggest a chronological development that takes place over time. The awareness of this tension leads me to suggest that a detailed analysis of the experiences of people currently being and becoming early career mathematics specialists may inform teacher education and newly qualified teacher (NQT) programmes and also that it may offer awarenesses to current early career primary mathematics specialists and those considering such a route in their teaching careers.

The evidence in my study will come primarily from talking to primary mathematics specialists and others involved in their development about their experiences:

Participant Group	Who?	Involvement?

1	4 early career primary maths specialists	3x narrative interviews (1 hour per interview) 2x reflective group discussion (1.5 hours per discussion at university) Review of narrative re-presentation with feedback
2	4 Head teachers	1x narrative interview of 40 mins Opportunity to review narrative re-presentation and give feedback
3	4 established primary maths specialists	1x narrative interview of 40 mins Opportunity to review narrative re-presentation and give feedback

Ethical issues discussed and decisions taken:

Time

The level of commitment involved, particularly for Group 1 participants, will need to be made clear.

Narrative

I will be re-telling people's stories, experiences, thoughts and opinions. While this will be made clear I have a responsibility to make sure their stories are re-presented with integrity. The methodology needs to be transparent as this way of working with data may not be familiar to people. The reflective groups and the opportunity to review and give feedback on narratives will be important.

Power

This is of particular relevance to Group 1 as this will be made up of people I have worked alongside on their PGCE year. As such I was their tutor and played a part in their completion of the PGCE. I am no longer in such a position, the relationship has shifted to a researcher / research participant one but it feels important to acknowledge the original relationship and ensure participants feel free to make a decision about continuing to work with me which is not based on me being their tutor. I must also consider that the conversations we have about their development could be influenced by our previous relationship – Group 1 participants may feel they need to tell me a successful story.

Researcher access / exit

Group 1: I plan to contact people I worked with last year to ask if they will continue working with me (this possibility was broached at the end of last year). Continuing working with these participants will extend our connection beyond that expected of a PGCE course so the

duration of the involvement will need to be expressed clearly with details of the end of the collaboration given (see participant information sheet).

Group 2: I intend to contact Heads of schools who have expressed an interest in having a PGCE primary maths specialist placed with them. I have convenient access to this group but I am asking for something beyond our usual involvement with Head teachers on the PGCE course. Participant information sheets will be provided and informed consent established.

Group 3: I intend to contact people who identify themselves as established primary maths specialists and ask if them if I can interview them for my work. Some people I know personally and some by their reputation. Participant information sheets will be provided and informed consent established.

Participant's right of withdrawal

Participants have the right to withdraw at any point in the study and to withdraw their data if they wish. This is documented in the participant information sheet and the consent form.

Informed consent

Participant information sheets and consent form give details.

Complaints procedure

If you have any concerns, during or after the research project, or wish to contact an independent person to whom any questions may be directed or further information may be sought from, please contact: gsoe-ethics@bristol.ac.uk

Safety and well-being of participants/researchers

If any sensitive issues arise in interviews or reflective groups options to turn of the recorder, discontinue the interview / discussion and / or delete the data will be given.

Anonymity / confidentiality

Any reporting will preserve the anonymity of the participant.

Data collection

Interviews and group reflections will be recorded on a Dictaphone.

Data analysis

Recordings will be transcribed and re-presented as narratives.

Data storage

Interviews will be downloaded to my computer and stored in Dropbox and titled with initials only. Technical support has been sought about how secure Dropbox is and as my account is password protected this is seen as being as secure as any other form of storage and is appropriate for this type of data. I will also store the interviews on my Dictaphone until I have transcribed them (for ease of transcription) but will delete them from the Dictaphone once

transcription is complete. Data will be kept for as long as is required (until completion of PhD study plus time stipulated to keep evidence base).

Data Protection Act

I have accessed and read the data protection guidance on the University of Bristol website http://www.bris.ac.uk/secretary/dataprotection/materials.html. The participant information sheet and consent form reflect the guidance given.

Feedback

The option to read re-presentations of data before the final presentation of narratives will be given to all participants. For Group 1 participants this process is integral to my methodology and this is reflected in the participant information sheet.

Responsibilities to colleagues/academic community

Interpretation will be an inherent part of my analysis; my interpretive stance will be discussed, explained and explored as part of my research. Individuals and schools will not be identifiable from data reported as it will be anonymised and generalised.

Reporting of research

As well as the final thesis it is anticipated this research will be reported in articles and at conferences. This is acknowledged in the participant information sheet.

Record of discussion with fellow researcher

Agreed to include participant information of each group of people on one sheet so that all participants have a sense of how they fit into the project as a whole. Agreed to reimburse for travel and parking expenses. Discussed idea of offering payment to Group 1 participants in acknowledgement of their time. Agreed that this raised ethical conflicts – about the nature of such research projects for other researchers and participants, putting undue pressure on participants to complete all elements of the project, changing nature of relationship and this impacting on data – and decided to not have a payment (beyond reimbursement of costs). Discussed ways of communicating information of the length of the project to group 1 participants: decided to set up first interviews and as part of this meeting to spend 10 minutes talking through the rest of the project so that participants are fully informed. Participants can then choose whether to continue with the rest of the process or not.
In identifying Head teachers to interview we discussed asking people who will be having a primary maths specialist with them in March 2017, as they will not have met the trainee. Their views will then be about expectations rather than commenting on the trainee in person. This will mean arranging Head teacher interviews in Jan / Feb.

Discussed importance of unstructured interviews so that people have opportunity to comment on things I may not have anticipated. Narrative structure of interview will need to be communicated once participant has agreed to be interviewed as will relevance of reviewing re-presentations.

Signed: CJOrmesher (Researcher)
Date: 8.11.16

Signed: Ruth Barrington (Discussant)
Date: 8.11.16

3d: Ethical Approval

Ethics Online Tool: application signed off

1 message

Research Governance and Ethics Officer <Liam.McKervey@bristol.ac.uk>

To: co13901@bristol.ac.uk

Your online ethics application for your research project "Primary mathematics specialism: narratives of being, learning and doing" has been granted ethical approval.

Please ensure that any additional required approvals are in place before you undertake data collection, for example NHS RandD Trust approval, Research Governance Registration or Site Approval.

For your reference, details of your online ethics application can be found online here: http://www.bristol.ac.uk/red/ethics-online-tool/applications/45062